T05T-1

PROJECT DEVELOPMENT PLAN

SCOUT PROGRAM

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LANGLEY RESEARCH CENTER

LANGLEY STATION HAMPTON, VA.

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PROJECT DEVELOPMENT PLAN FOR SCOUT LAUNCH VEHICLE

I. PROJECT SUMMARY

1. OBJECTIVES:

(a) Development: To develop a relatively inexpensive, reliable, solid-propellant rocket vehicle for use as a satellite launcher and research vehicle (Figure 1).

(b) Operational: To maintain a standard configuration vehicle suitable to the requirements of NASA and the Department of Defense. Similar launch equipment, checkout equipment and procedures compatible with the vehicle shall be maintained and repaired or replaced as required, at Wallops Island, Virginia, and Point Arguello, California. To improve production vehicles, specifically by the correction of deficiencies uncovered during operational use of the vehicles.

2. STATUS:

(a) The current statistics for the Scout program are as follows:

PHASE	FUNDS (Millions)	LAUNCHES	REMARKS
Development-Scout	18.6	8	Explorer IX and XIII. Also includes X-254 and Velocity Control programs
Advanced Motor Dev.	4.3		X-258, X-259, Algol IIA, Castor II
Launch Complex & GSE	2.6		Wallops tower and PMR launcher
Mark II Launcher	1.5		Wallops Number 2 launcher
Production Scouts-NASA	25.2	4	Explorer XVI, (18 vehicles in production or inventory)
Production Scouts-DOD	26.4	10	Includes Navy and Air Force programs (18 vehicles in production or inventory)
Production Scouts-AEC	3.2	1	(3 vehicles in production or inventory)
Operational Support	3.4		Includes standardization program
	85.2		

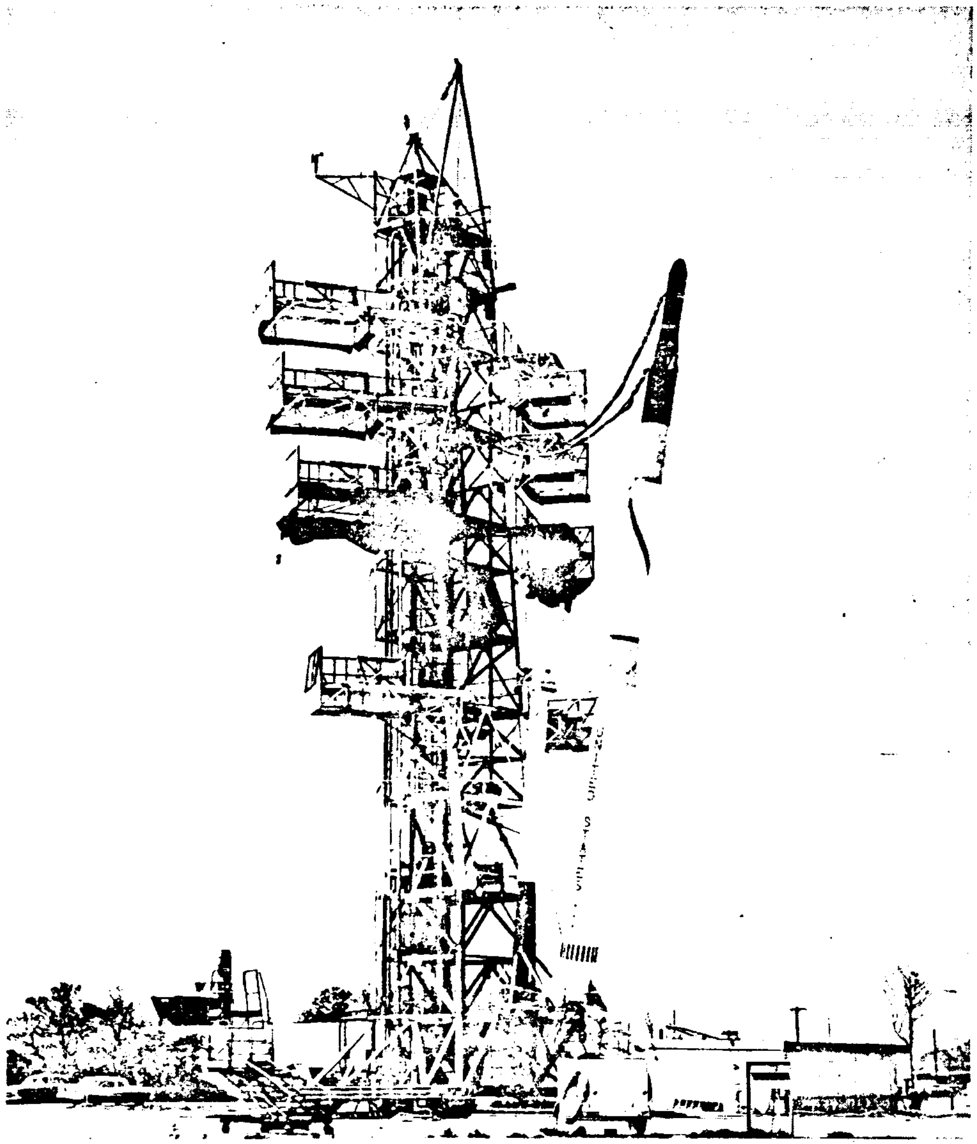


Figure 1.- Vehicle ST-1 was the first Scout launched on July 1, 1960.

(b) The final configuration of the vehicle will be capable of placing a 280-pound satellite into a 300-nautical mile easterly launched orbit. The development of new solid propellant motors increased the Scout's capability as shown in figure 2.

3. COSTS:

(a) Development costs, exclusive of institutional support, through completion in fiscal 1963 were approximately $26 million.

(b) Operational vehicles are estimated to cost $885,000 each exclusive of launching costs. Wallops Island launch crew costs are approximately $1.0 million per year. Pacific Missile Range costs are borne by the Department of Defense. Operational support is estimated at $3.5 million per year starting in fiscal 1964.

(c) Program authority was provided as follows:

	FY59	FY60	FY61	FY62	FY63	FY64	Total
Development	7.2	3.0	6.9	4.7	3.7		25.5
Production				8.2	9.0	8.0	25.2
Operational Support						3.4	3.4
C of F					1.5		1.5
Reimbursables			2.3	18.2	9.2	4.0	33.7
Total	7.2	3.0	9.2	31.1	23.4	15.4	89.3

4. MAN-POWER:

(a) The estimated Langley Research Center manpower requirements for the accomplishment of the Scout project are: (direct)

FY1958	FY1959	FY1960	FY1961	FY1962	FY1963	FY1964	FY1965
6	100	110	85	100	89	106	117

5. TIME REQUIREMENTS:

(a) Development: The first Scout vehicle was launched in June 1960. The final uprated configuration will be available in mid-1964.

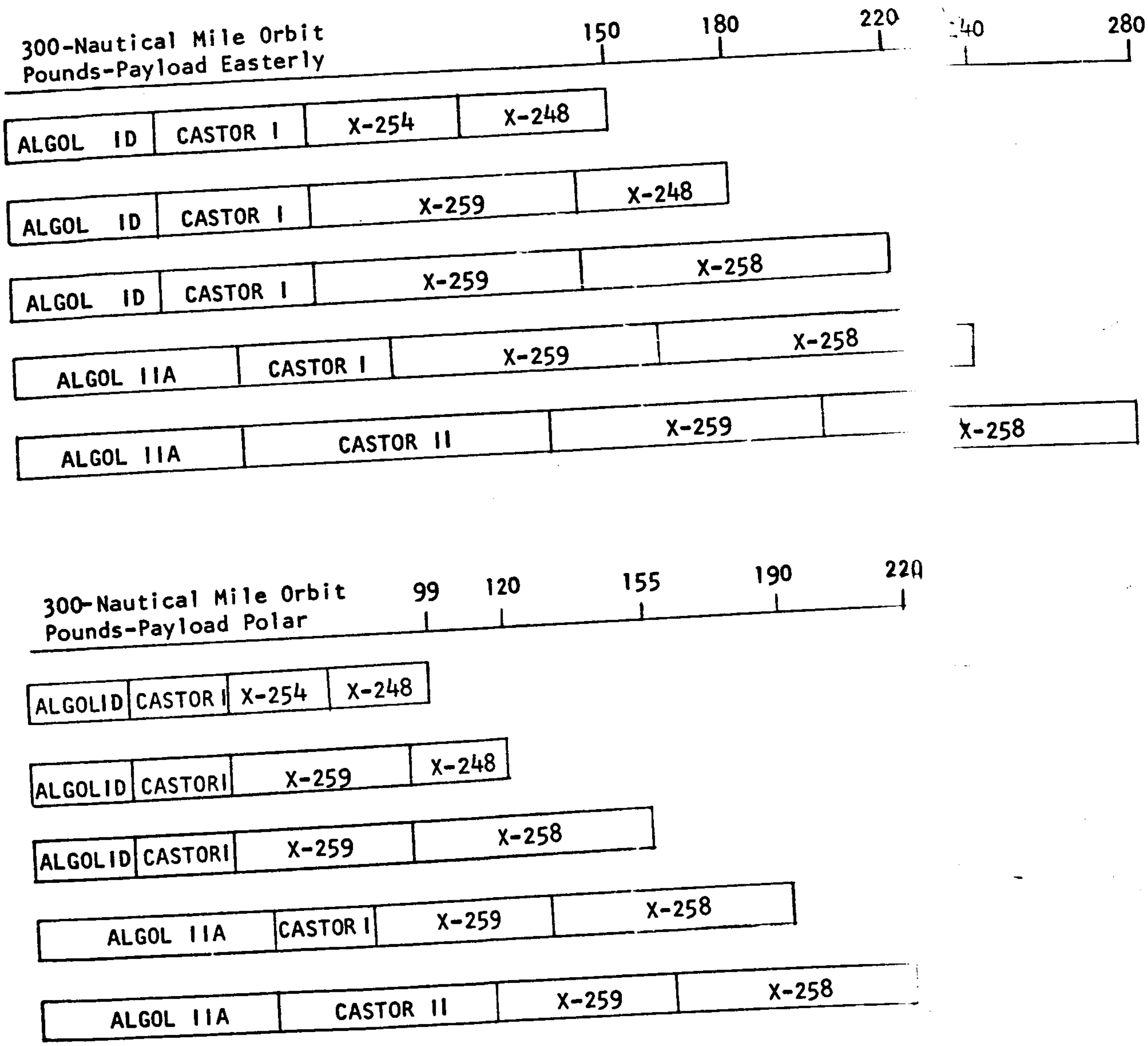


Figure 2. - Motor Upgrading

(b) Operational: The first operational launch from Wallops Island was in March 1962. The first Pacific Missile Range, Point Arguello, launch was in April 1962. Usage of Scout vehicles is planned through 1970.

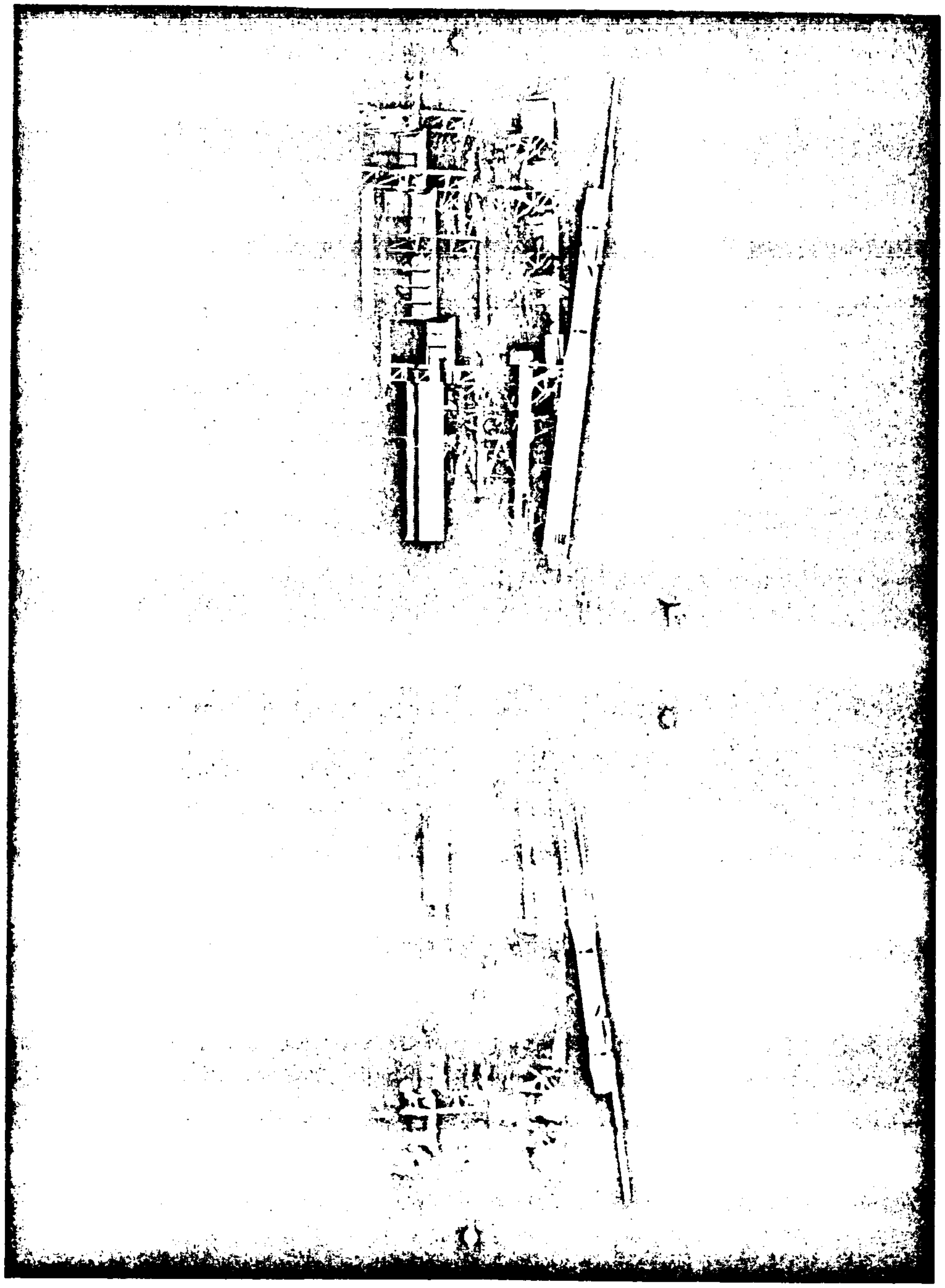


Figure 3.-The first reentry launch for Scout was ST-8 launched March 1, 1962, at 00:07 a.m. Photo shows reflection of night operation prior to take-off.

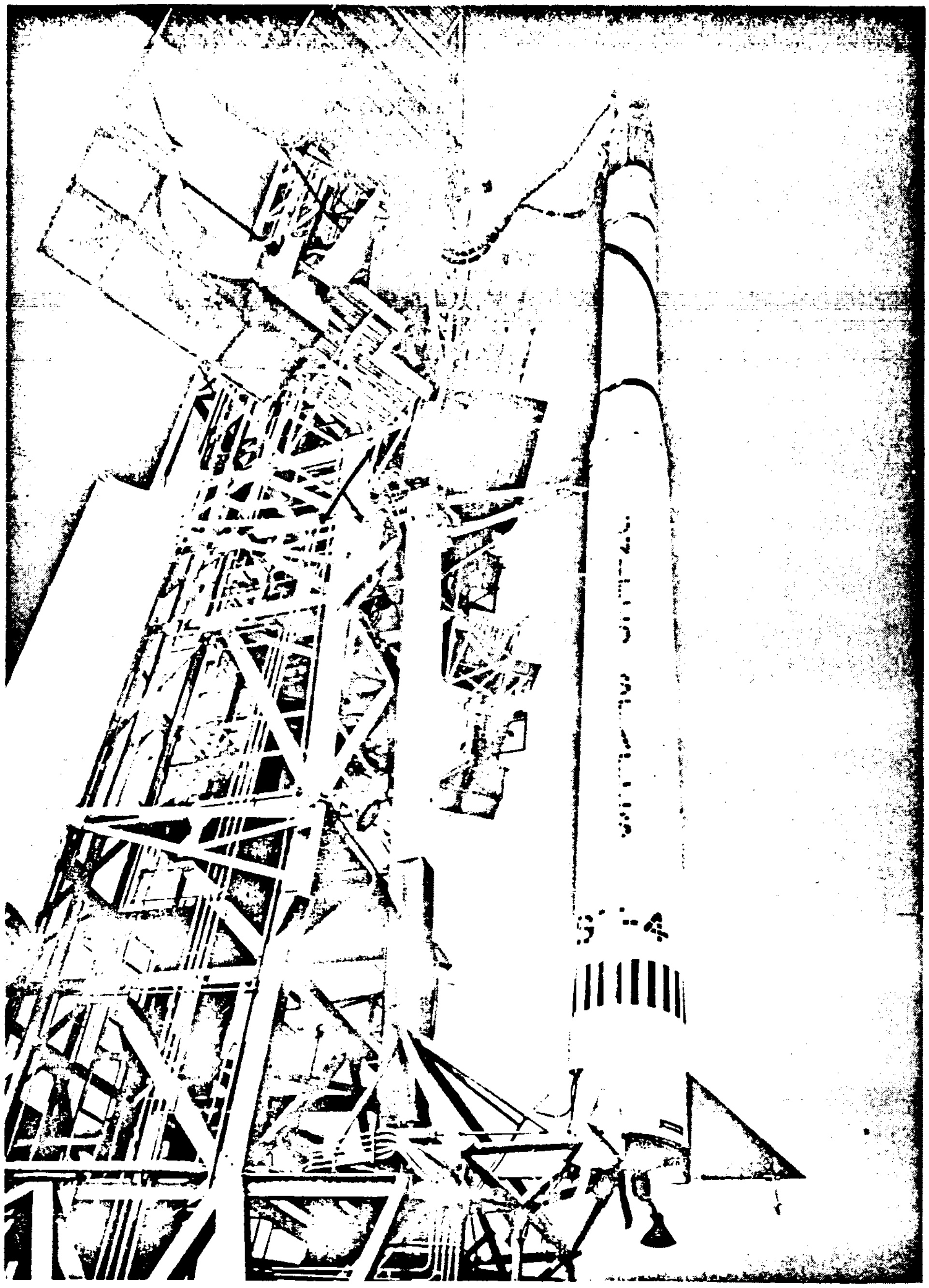


Figure 4 - Scout Test No. 4 was the first orbital flight. It placed Explorer IX (12-foot sphere) in orbit on February 16, 1961. Photo shows vehicle on launcher prior to take-off.

II. JUSTIFICATION AND HISTORY

1. JUSTIFICATION:

The Scout is required as a relatively inexpensive vehicle to accomplish satellite, probe, and reentry missions. Small scientific payloads require a relatively inexpensive system which the Scout vehicle provides.

(a) Development Phase: Typical Missions - (Payloads were carried on seven vehicles of the eight development flights).

(A) Primary

Vehicle development

(B) Secondary

Reentry Experiment (note figure 3)

Ionosphere probes

Orbits (Micrometeoroid - S-55, Air Density Experiment, Explorer IX)(note figure 4)

(C) Results: The results of the development program included five successes, one partial success, and two failures. The eight launches ended with a trained field crew and operational launch complex at Wallops Station. The causes of the failures were corrected and an excellent cold separation system is one of the many improvements that resulted. The third-stage heat shield was eliminated and a new improved 34-inch payload heat shield was developed. A transition "E" section, which will provide fourth-stage performance and environmental data, will soon be incorporated into the Scout system.

In addition, three of the four solid-propellant motor stages were successfully upgraded (see figure 2) and the second stage is at present in the process of being upgraded.

(b) Operational Phase: (Fiscal 1962 and 1963 NASA/DOD Scout vehicles under contract total 50).

(A) The Scout, having proved itself, was assigned a variety of missions.

S-48 - Fixed Frequency Topside Sounder

S-52 - International Satellite, United Kingdom No. 2

S-55 - Micrometeoroid Measurements

S-66 - Polar Ionosphere Beacon Satellite

Air Density/Injun Explorers

SERT Program

Reentry Experiments

DOD Missions

AEC Missions

Italian Requirements (San Marco)

2. HISTORY:

The Scout was initiated in late 1958 by the Langley Research Center as a research vehicle. The development flight-test program consisted of eight vehicles, the last being launched in March 1962. The initial capability was 150 pounds easterly launched into a 300-nautical mile orbit with a desired final capability of 300 pounds to be obtained by uprating all four motor stages to the latest state-of-the-art. To date, the first-, third-, and fourth-stage upratings have been completed. The second-stage program is under contract with availability planned for mid-1964.

The only major improvement revealed necessary by the development program was a disturbance at fourth-stage separation. The fourth-stage separation disturbance, tip-off, was corrected by changing from diaphragm rocket blast separation (hot) to a (cold) spring-loaded separation device between third and fourth stage. This redesign was incorporated on vehicle No. 8 and subsequent vehicles and has proven satisfactory.

Operational flight experience necessitated the following major modifications to date:

(a) A balanced electrical ignition system and increased battery voltage to provide adequate electrical power margins to the pyrotechnic devices in the vehicle.

(b) Improved manufacturing procedures, revised assembly procedures, change in adhesive systems, and improved inspection were necessary to correct the Algol IIA nozzle failure.

(c) Temperature environment of transition C was lowered to insure satisfactory operation of the Hydrogen Peroxide Control System.

(d) New, improved Deutsch plugs have been integrated into the system.

(e) As a result of a continuing reliability program, the following new items were developed and introduced into the Scout system.

(A) Inverters

(B) Backup Gyros

(C) Armalon Barriers or Reaction Jets

(D) Colvin Transducers

(E) Improved Control System Fittings

(F) Poppet Valve Electronic Boards

(G) Pressure Regulator - Vent Valve

(H) Quick Disconnect Fittings for Control System

(I) Factory Sealed Base A Hydraulic System

An altitude accuracy improvement to meet DOD requirements is under contract. This velocity control on the third stage will be available in the second quarter of 1964 and will provide a 2-sigma tolerance of ±54-nautical mile altitude on 300-mile circular orbits in lieu of the present ±85 nautical miles.

The flight-test history through October 1963 is listed in tables I and II.

TABLE I

NASA SCOUT FLIGHT SUMMARY (Development)

Flt. No.	Vehicle No.	Launch Site*	Date	Mission (Payload)	Apogee (pred.)	Perigee (pred.)	Incl.	Vehicle Perform.	Remarks
1	ST-1	WI(1)	7- 1-60	Probe				Success	Ground Radar error caused Range Safety to command no fourth stage ignition.
2	ST-2	WI(2)	10- 4-60	Probe 85#	3100			Success	Vehicle Instrumentation +30# AFSWC Package.
3	ST-3	WI(3)	12- 4-60	Orbital (S-56)				Failure	12' Balloon. No second stage ignition
4	ST-4	WI(4)	2-16-61	Orbital (S-56a)	1400 (1500)	364 (360)	38°	Success	Explorer IX. 12' Balloon. Air density experiment
5	ST-5	WI(5)	6-30-61	Orbital (S-55)				Failure	Micrometeorite satellite. No third stage ignition.
6	ST-6	WI(6)	8-25-61	Orbital (S-55a)				~~Partial~~ Failure	Explorer XIII. Micrometeorite satellite. Excessive fourth stage tip-off resulted in limited orbit time
--------Start redesign from Hot Separation to Cold Separation 4th to 3rd Stage due to tip-off------------------------									
7	ST-7	WI(7)	10-19-61	Probe (P-21) 100#	3700			Success	Ionosphere probe.
8	ST-8	WI(8)	3- 1-62	Reentry				Success	First high speed reentry test. Measure extreme heating conditions. First cold separation system.

* WI - Wallops Island, Virginia
PMR - Pacific Missile Range, Point Arguello, California

TABLE II

NASA SCOUT FLIGHT SUMMARY (Operational)

Flt. No.	Vehicle No.	Launch Site	Date	Mission (Payload)	Apogee (pred.)	Perigee (pred.)	Incl.	Vehicle Perform.	Remarks
9	ST-9	WI(9)	3-29-62	Probe (P-21a) 150#	3400			Success	<u>First X-259 motor</u>. (Third stage)
10	S-111	PMR	4-26-62	Orbital				Failure	Leak in GSE defueled third-stage control system prior to launch.
11	S-112*	PMR	5-24-62	Orbital				Failure	Self-destruction 0.3 sec. after second-stage ignition. (Cause undetermined)
12	S-117*	PMR	8-23-62	Orbital	467 (428)	347 (385)	0.2°	Success	
13	S-114	WI(10)	8-~~29~~ 31-62	Reentry				Failure	Delayed ignition of third-stage motor due to electrical short. <u>First flight for Algol IIA</u> (Successful)
-------3-Month Investigation---Electrical connector rework heatshield and ignition system changes----------------------									
14	S-115	WI(11)	12-16-62	Orbital (S-55b)	638 (593)	405 (395)	52° (51.4)	Success	Explorer XVI. (222 lbs. including fourth stage).
15	S-118	PMR	12-18-62	Orbital (Tran. 5A)	395 (470)	375 (396)	90.6° (90)	Success	Transit 5A - Payload failed (140#).
16	S-126*	PMR	2-19-63	Orbital				Success	
17	S-119	PMR	4- 5-63	Orbital (Transit)				Failure	Third-stage coast control failure. (Cause undetermined)
18	S-121*	PMR	4-26-63	Orbital				Failure	Third-stage thrust terminated at 27.1 seconds due to inadvertent destruct action.
19	S-116	WI	5-22-63	Reentry				Success	
20	S-120	PMR	6-15-63	Orbital (Transit)	396 (398)	418 (460)	89.98 (90.01)	Success	

TABLE II. (Continued)

NASA SCOUT FLIGHT SUMMARY (Operational)

Flt. No.	Vehicle No.	Launch Site	Date	Mission (Payload)	Apogee (Pred.)	Perigee (pred.)	Incl.	Vehicle Perform.	Remarks
21	S-113	WI	6-28-63	Orbital	705 (675)	224 (223)	49.7 (50.02)	Success	First flight for X-258 motor (fourth stage)
22	S-110	WI(12)	7-20-63	Reentry				Failure	First-stage Nozzle failure
23	S-132	PMR	9-27-63	Orbital				Failure	Third Stage Coast Control Failure (Excessive Heat)
			— — —	— [illegible] tion program					
24	S-122	PMR(13)	12-19-63	Orbital	(1616)	(322)	(78.50)	Success	Explorer XIX 12-ft Balloon Air Density experiment. First flight for redesigned Algol IIA nozzle.
25	S-127	WI (14)	3-27-64	Orbital-UK	(821.9) 732.3	(150) 156	(52.0) 51.7	Success	UK-C British experiment. Ariel II
	131	Demonstration							
26	S-125	PMR	6-3-64	Orbital-Transit	(588.1) 517	(476) 458	(90.01) 90.58	Success	
27	S-128	PMR	6-25-64	Orbital	(1178)	(162.78)	82	Failure	Self destruction after 2nd st ignition
28	S-124	WI (15)	7-20-64	probe				Success	Lewis experiment SERT
29	S-129	WI (16)	8-18-64	Reentry				Success	Apollo support
30	S-134	PMR	8-25-64	Orbital				Success	S48
31	S-130	WI (17)	10-9-64	Reentry				Success	RFD Reentry Flight Demonstration (3 stages)
32	S-123	PMR	10-9-64	Orbital				Success	S66 Beacon Explorer
33	137	WI	11-6-64	Orbital				Success	S55 Micrometeorid
34	135	PMR	11-21-64	Orbital				Success	S48
35	137	WI	12-15-64	Orbital	443.34 (365.29)	111.24 (115.05)	38.0 (37.69)	Success	SMA Air density & ionospheria

* Special Scout vehicles
WI - Wallops Island, Virginia
PMR - Pacific Missile Range, Point Arguello, California

III. TECHNICAL PLAN

The scout program provides vehicles and services to boost payloads for orbital, probe, and reentry missions.

1. GENERAL DESCRIPTION:

The basic Scout space vehicle is a four-stage guided booster utilizing solid-propellant rocket motors. A photograph of a typical Scout leaving the launcher is shown in figure 5. A general arrangement drawing of the Scout vehicle is shown in figure 6. The major structure and rocket motor assemblies of the Scout vehicle are as shown in table III.

TABLE III - SCOUT STAGES

Stage	Assembly
1	Base Section A (includes fins and jet vanes) Algol IIA rocket motor Transition B-Lower (includes blowout diaphragm)
2	Transition B-Upper Castor I (XM-33) rocket motor Transition C-Lower (includes blowout diaphragm)
3	Transition C-Upper Antares X-259 rocket motor Transition D-Lower Transition D-Center (includes spin bearing and separation system)
4	Transition D-Upper Altair X-258 rocket motor (alternate X-248) Heat Shield Transition E (includes cold separation system) (not available until 1964)
5	Payload Assembly (may be used as part of fourth stage)

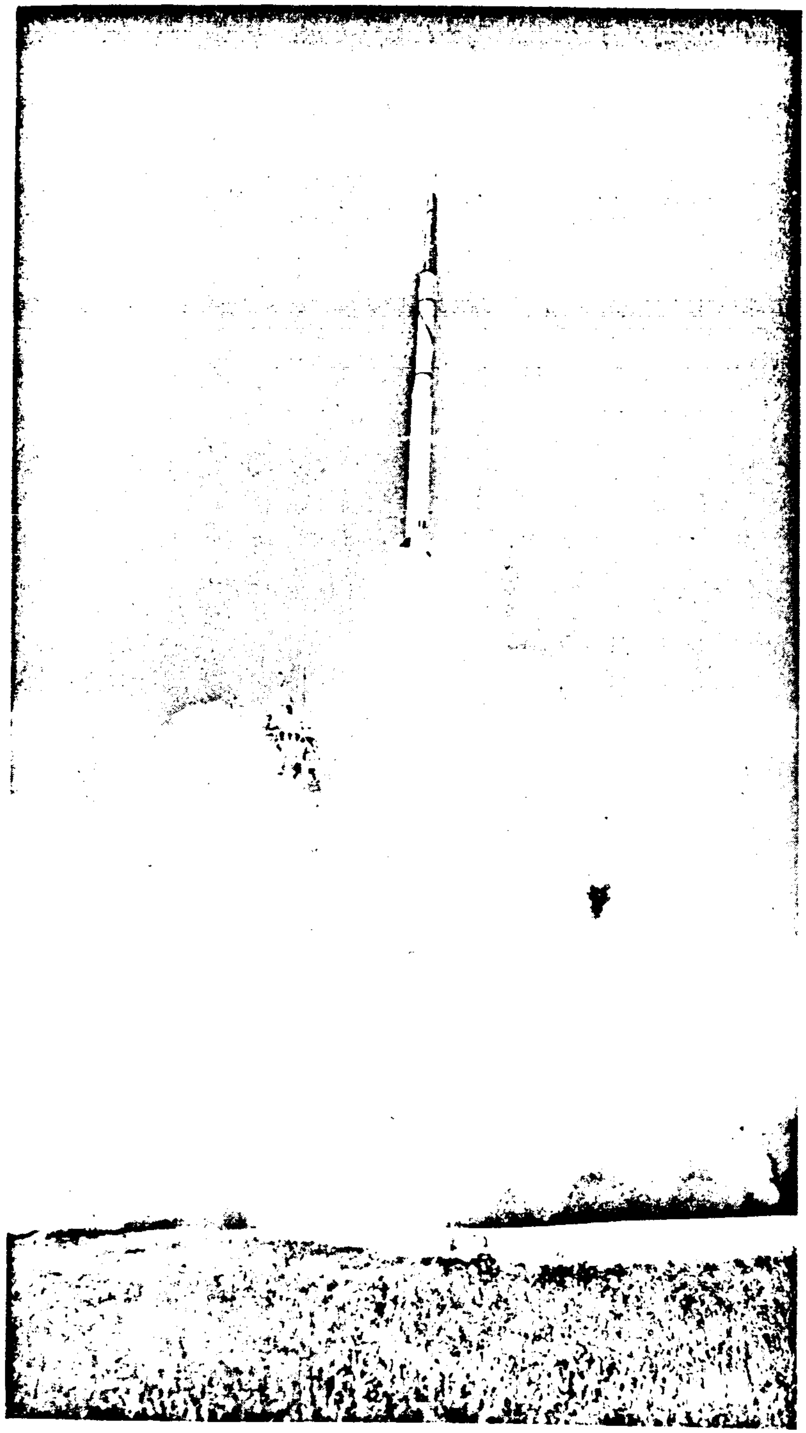


Figure 5.- ST-7 with a P-21 GSFS probe left the launcher October 19, 1961, and obtained a maximum altitude of 3,700 nautical miles.

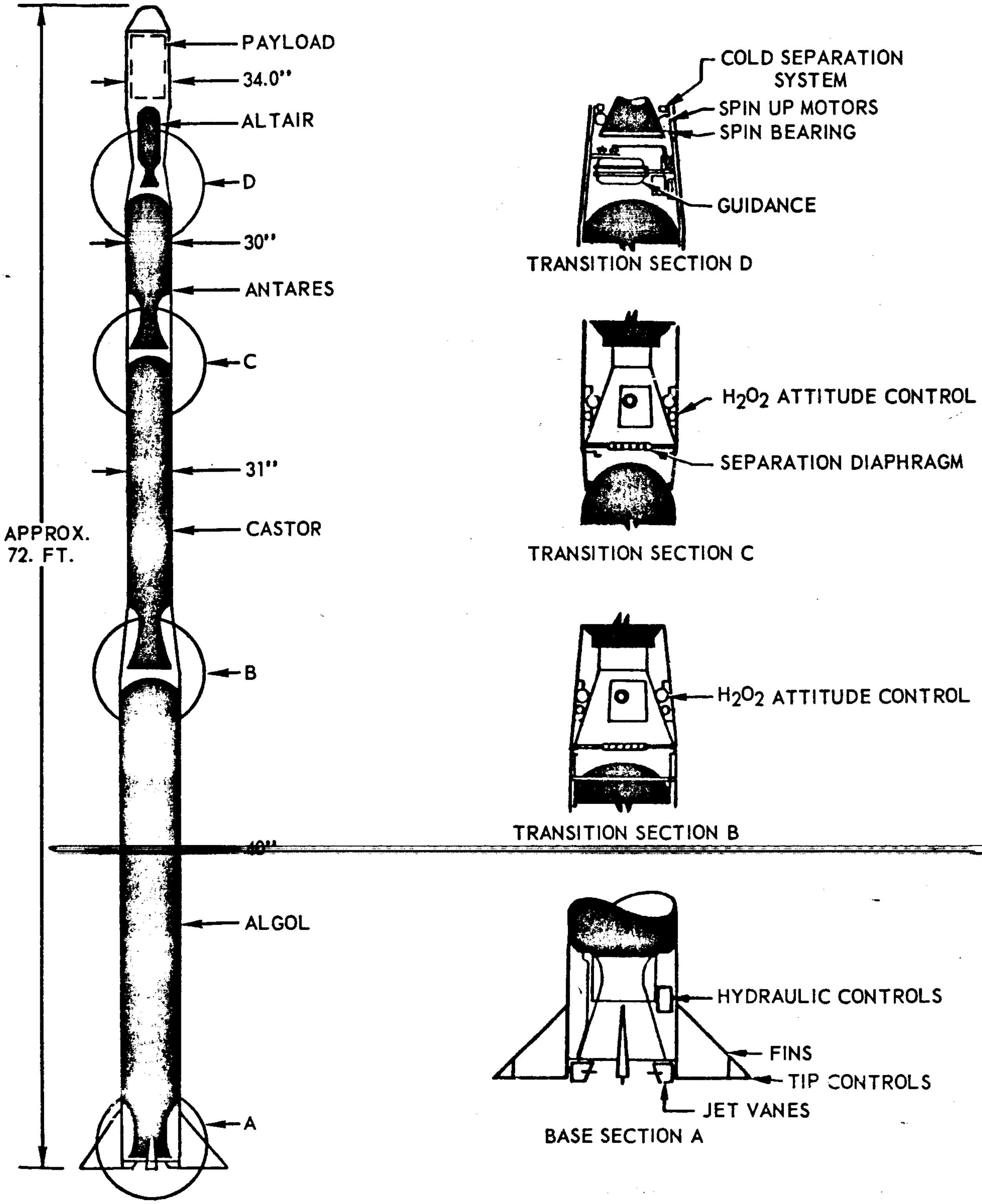


Figure 6.- Vehicle general arrangement.

2. MISSION:

For all trajectories, the first-stage motor remains attached to the vehicle after burnout and the vehicle coasts to an altitude with a nominal "q" of approximately 40 pounds per square foot to first-stage separation. The maximum "q" is 2,200 pounds per square foot and is reached at about 36,000 feet altitude. Each type of trajectory has requirements itemized as follows:

(a) Orbital: The third and fourth stages coast together after burnout of the third stage. The guidance and control units mounted in the third stage control these coasting stages. When the desired orbital altitude is reached, the fourth stage is spun up by spin rockets and ignited after separation and third-stage retro.

(b) Probe: Except for aerodynamic "q" at second-stage ignition and rocket motor tail off considerations, minimum delay is programmed between firing of successive stages.

(c) Reentry: The vehicle is programmed such that the final stage or stages intercept the atmosphere at prescribed angles, velocities, altitudes, and ranges.

3. FLIGHT PATH:

The vehicle is launched vertically and is programmed to achieve zero lift flight paths equivalent to launch angles between 82.5° and 87°. The vehicle is programmed in pitch until the desired zero-lift trajectory is obtained.

4. VEHICLE:

(a) Airframe base and transition section composition are outlined in table IV. A detailed sketch of the Scout vehicle is shown in figure 7.

TABLE IV

BASE AND TRANSITION SECTION COMPOSITION

STAGE	SECTION	
1	BASE A	Aluminum semi-monocoque structure with steel fins and tip controls and 85/15 tungsten/molybdenum jet vanes.
	LOWER B	Aluminum semi-monocoque structure.
2	UPPER B	Laminated glass cloth with phenolic resin (not primary structure).
	LOWER C	Laminated glass cloth with phenolic resin (monocoque structure).
3	UPPER C	Laminated glass cloth with phenolic resin (semi-monocoque structure).
	LOWER D	Steel and aluminum semi-monocoque structure.
4	UPPER D	Magnesium monocoque structure.
	PAYLOAD HEAT SHIELD	Laminated glass honeycomb with phenolic resin and Inconel nose cap.

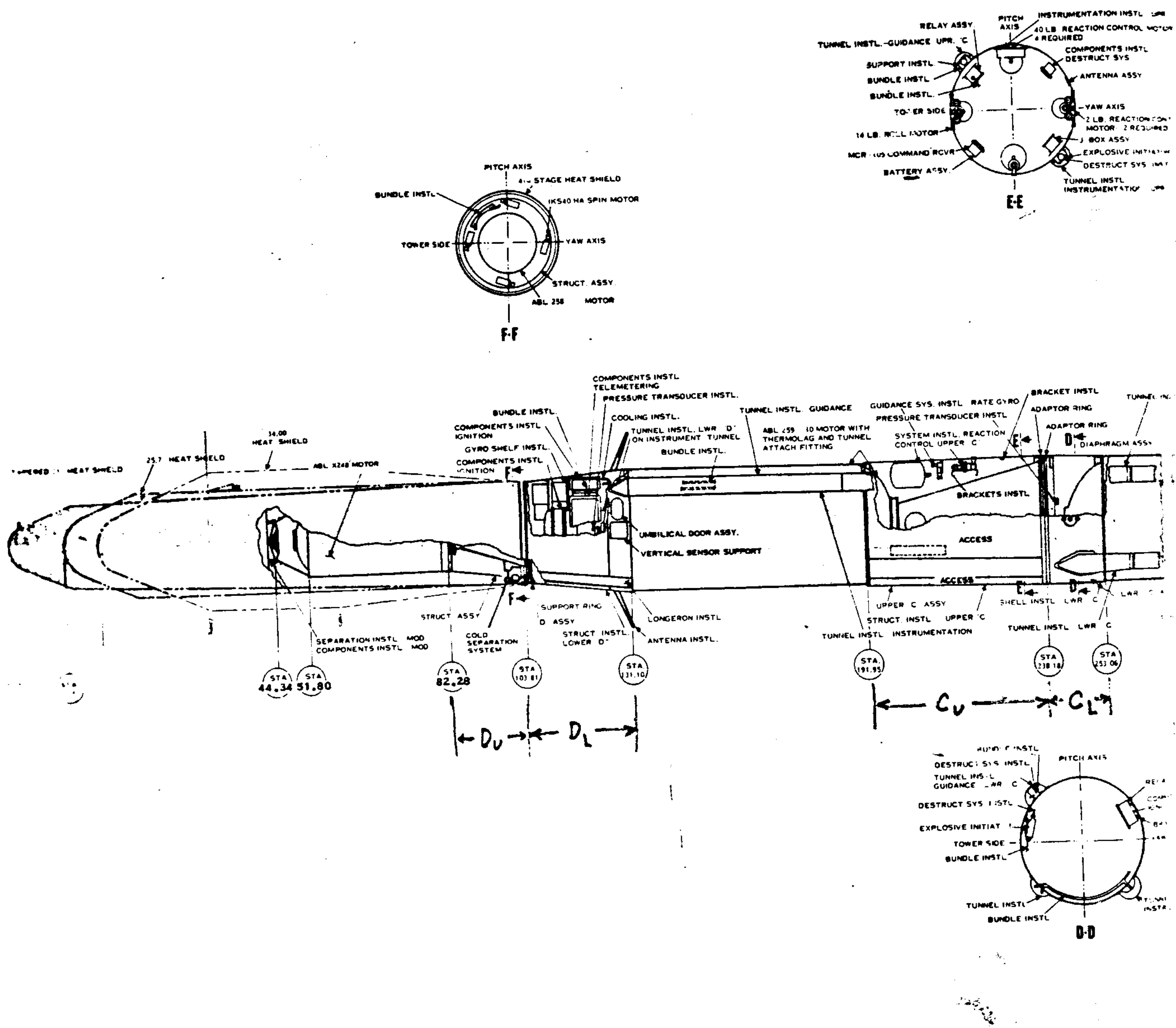
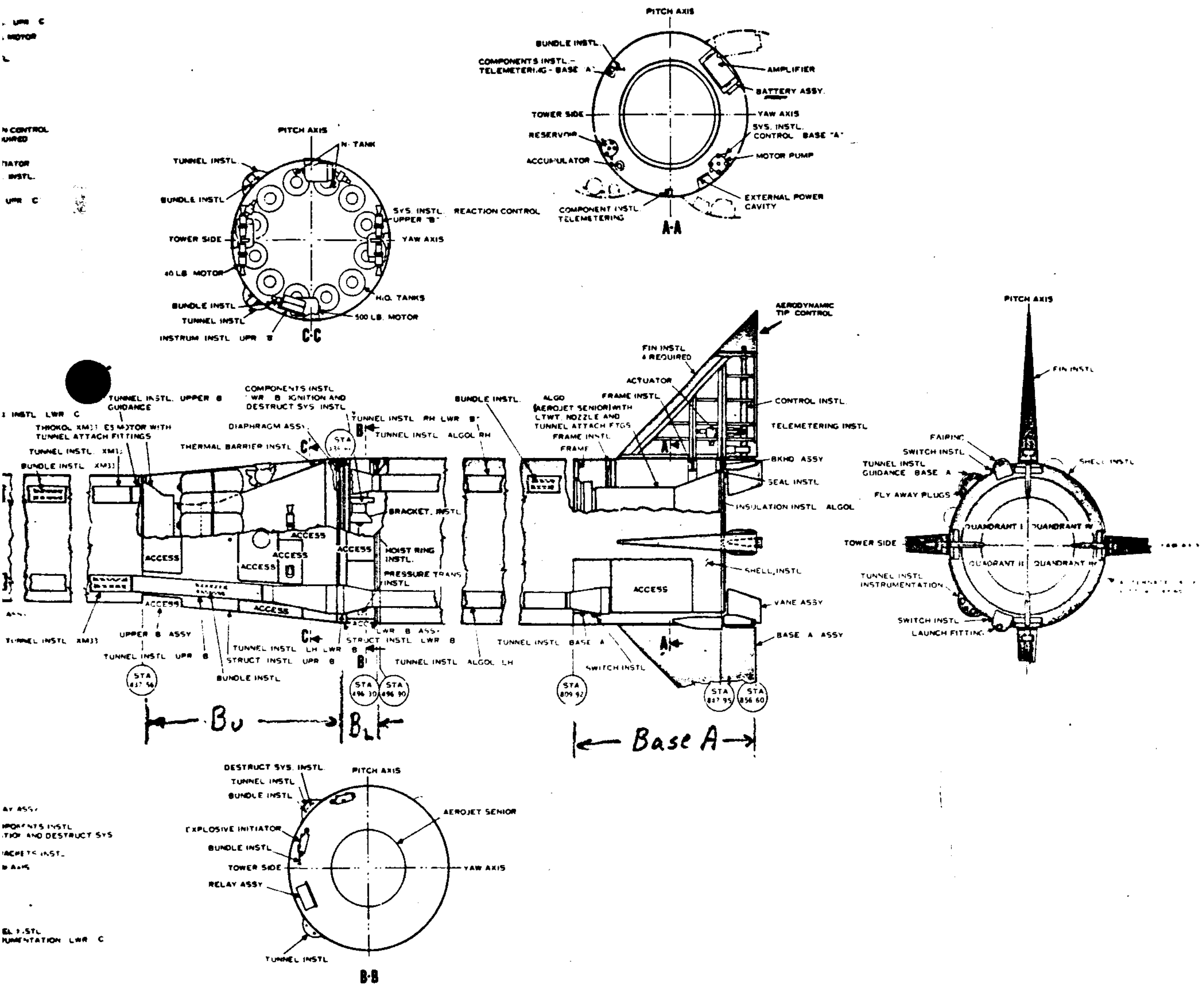


Figure 7.- Sketch showing basi


PITCH AXIS
BUNDLE INSTL.
COMPONENTS INSTL. - TELEMETERING - BASE "A"
AMPLIFIER
BATTERY ASSY.
TOWER SIDE
YAW AXIS
RESERVOIR
SYS. INSTL. CONTROL BASE "A"
ACCUMULATOR
MOTOR PUMP
EXTERNAL POWER CAVITY
COMPONENT INSTL. TELEMETERING
A-A
PITCH AXIS
N₂ TANK
TUNNEL INSTL.
BUNDLE INSTL.
SYS. INSTL. REACTION CONTROL UPPER "B"
TOWER SIDE
YAW AXIS
40 LB. MOTOR
H₂O₂ TANKS
BUNDLE INSTL.
TUNNEL INSTL.
500 LB. MOTOR
INSTRUM INSTL. UPR B
C-C
AERODYNAMIC TIP CONTROL
FIN INSTL. 4 REQUIRED
ACTUATOR
FRAME INSTL.
CONTROL INSTL.
TELEMETERING INSTL.
BKHD ASSY
SEAL INSTL.
INSULATION INSTL. ALGOL
SHELL INSTL.
VANE ASSY
BASE A ASSY
SWITCH INSTL.
TUNNEL INSTL. BASE A
ACCESS
BUNDLE INSTL.
ALGO
AEROJET SENIOR WITH LTWT. NOZZLE AND TUNNEL ATTACH FTGS
FRAME INSTL.
FRAME
TUNNEL INSTL. RH LWR B
TUNNEL INSTL. ALGOL RH
TUNNEL INSTL. ALGOL LH
BRACKET INSTL.
HOIST RING INSTL.
PRESSURE TRANS INSTL.
COMPONENTS INSTL. LWR B IGNITION AND DESTRUCT SYS INSTL.
TUNNEL INSTL. UPPER B GUIDANCE
THIOKOL XM33 E5 MOTOR WITH TUNNEL ATTACH FITTINGS
DIAPHRAGM ASSY
THERMAL BARRIER INSTL.
TUNNEL INSTL. XM33
BUNDLE INSTL. XM33
ACCESS
UPPER B ASSY
TUNNEL INSTL. UPR B
TUNNEL INSTL. LH LWR B
STRUCT INSTL. UPR B
BUNDLE INSTL.
LWR B ASSY
STRUCT INSTL. LWR B
STA 809.92
STA 837.95
STA 856.60
Bu
BL
Base A
PITCH AXIS
FIN INSTL.
FAIRING
SWITCH INSTL.
TUNNEL INSTL. GUIDANCE BASE A
FLY AWAY PLUGS
QUADRANT I
QUADRANT IV
QUADRANT II
QUADRANT III
TOWER SIDE
TUNNEL INSTL. INSTRUMENTATION
SWITCH INSTL.
LAUNCH FITTING
DESTRUCT SYS. INSTL.
TUNNEL INSTL.
BUNDLE INSTL.
PITCH AXIS
AEROJET SENIOR
EXPLOSIVE INITIATOR
BUNDLE INSTL.
TOWER SIDE
YAW AXIS
RELAY ASSY
TUNNEL INSTL.
B-B

cout onents.

(b) Structure Assemblies:

(A) Base section A includes four cruciform fins and jet vanes, the first-stage hydraulic control system, and the first-stage telemeter equipment and antenna.

(B) Transition B includes the second-stage reaction-control system, a separation blowout diaphragm and the safe arm unit of the first-stage destruct system.

(C) Transition C includes the safe arm unit of the second-stage destruct system, the destruct system receivers and antennas in the lower section. The upper section includes the components of the third-stage control system including the reaction-control jets and the hydrogen peroxide and nitrogen tanks.

(D) Transition D includes the guidance package, radar beacon and antenna, guidance telemeter equipment and antennas, and the spin-up mechanism.

(c) Weight: The estimated vehicle stage weights are itemized in table V.

(d) Loads:

(A) Vehicle flight loads are shown in figure 8.

(B) Upper wind restrictions are illustrated in figures 9 and 10.

5. PROPULSION:

The physical data of the four rocket motors used on the present Scout is itemized in table VI.

TABLE V - VEHICLE ESTIMATED WEIGHTS BREAKDOWN.

(With 200 Pound Payload and 34", Minus 25 Station Heat Shield)

Vehicle Configuration	Vehicle Weight, lb
First-stage ignition	38,534
First-stage burnout	17,124
Second-stage ignition	13,921
Second-stage burnout	6,370
Third-stage ignition	4,171
Third-stage burnout	1,554
Fourth-stage ignition	788
Fourth-stage burnout	277

TABLE VI - ROCKET MOTORS.

Stage	Motor	Diameter, in.	Weight, lb
First	Algol IIA	40	23,610
Second	Castor (XM33-E5)	31	8,869
Third	Antares (X259-A3)	30	2,795
Fourth	Altair (X258-B1)	18	573

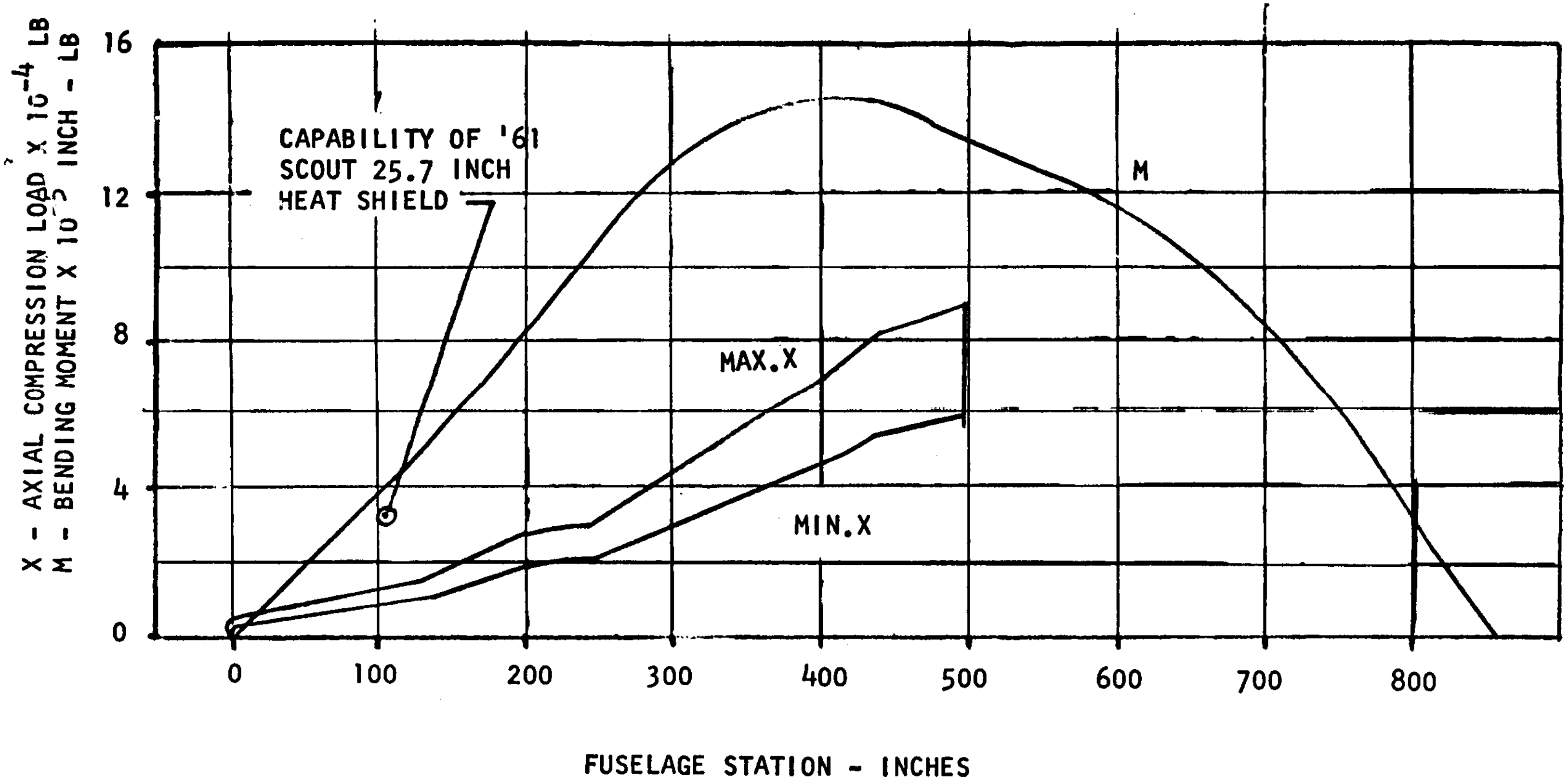


Figure 8.- Vehicle flight loads (ultimate).

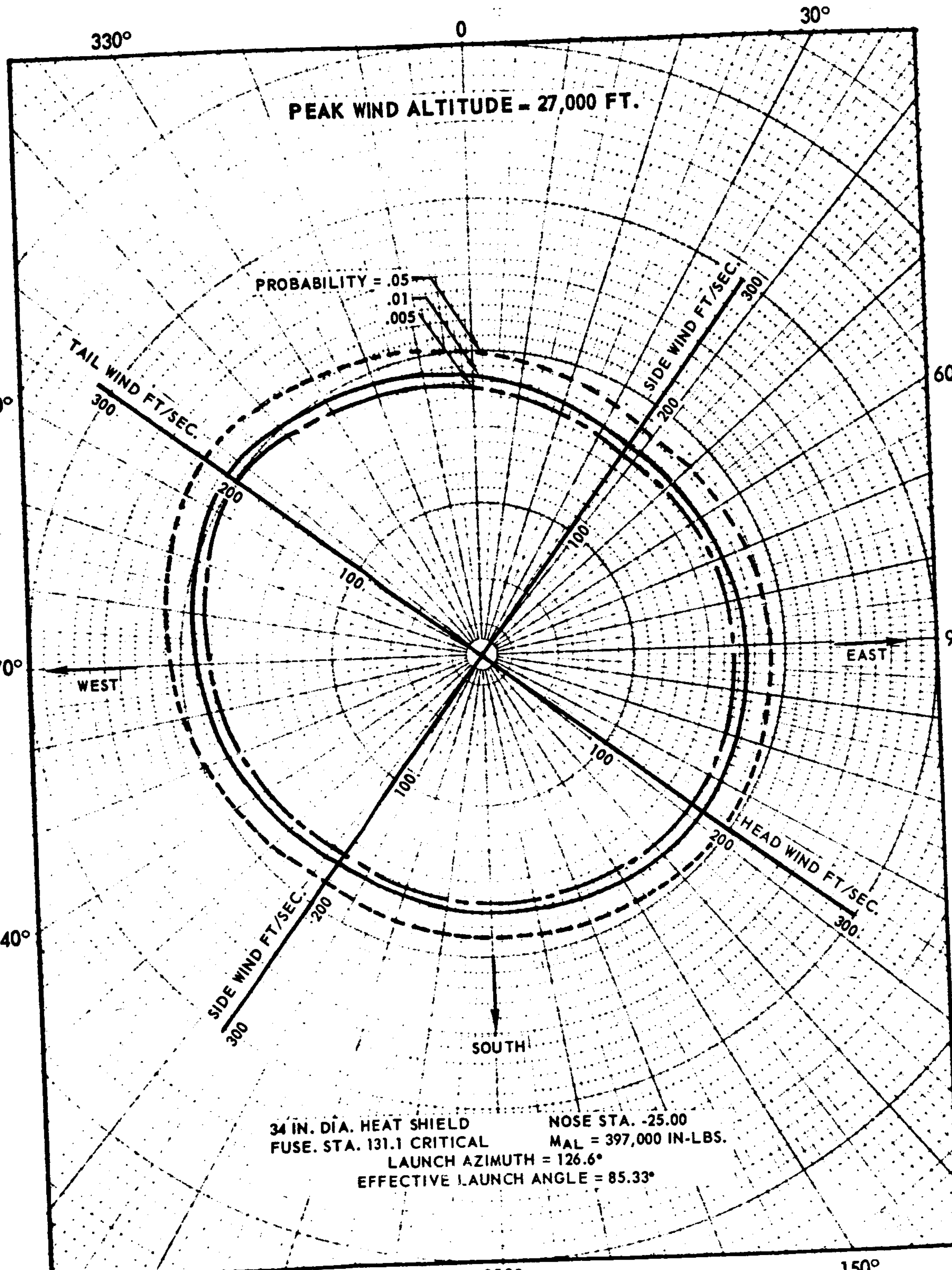


Figure 9.- Scout Vehicle S-113 probability of exceeding flight allowable bending moment versus peak wind speed and direction.

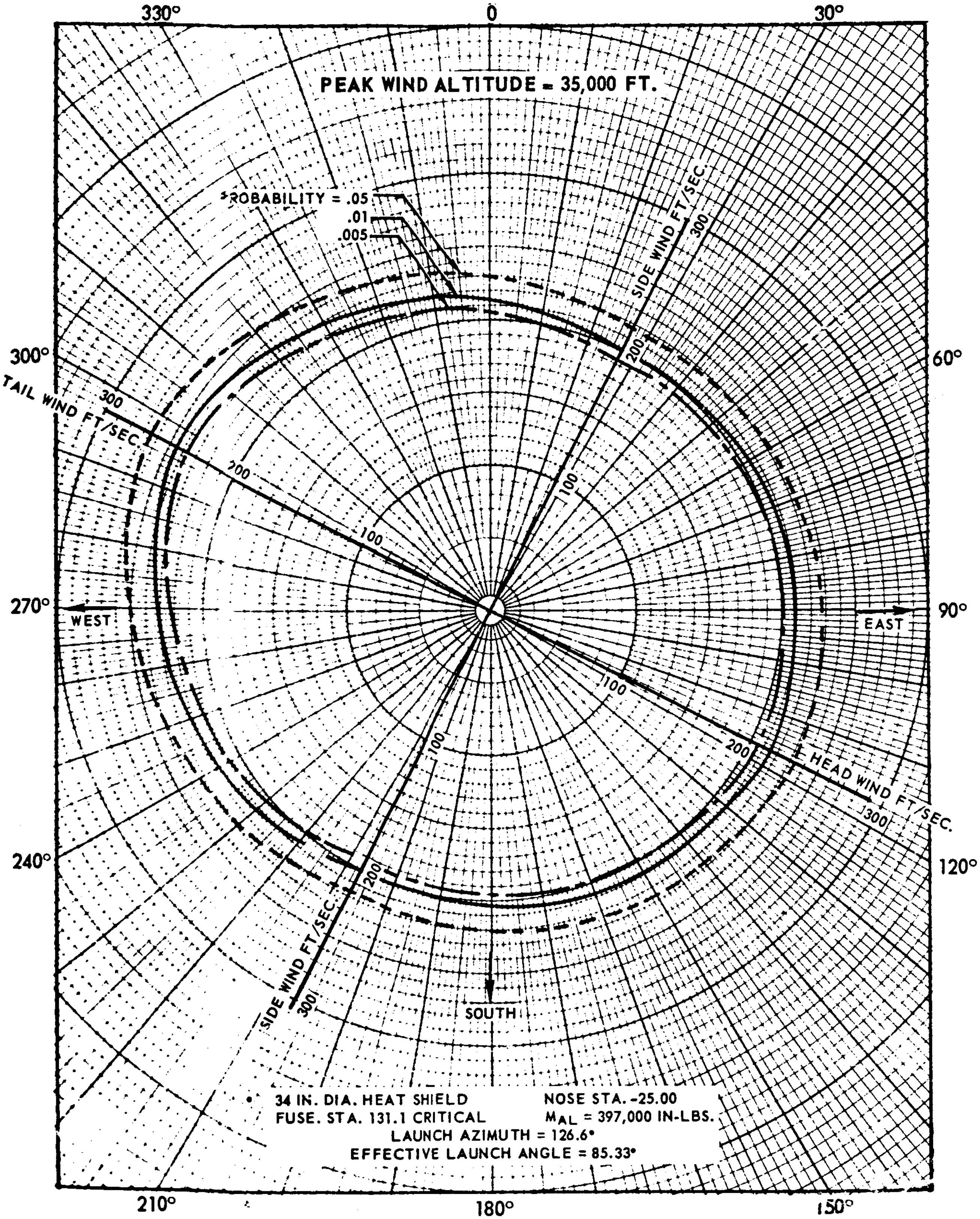


Figure 10.- Probability of exceeding flight allowable bending moment versus peak wind speed and direction.

(a) The Algol IIA Scout first-stage propulsion unit is being produced by the Aerojet General Corporation, Sacramento, California. The original Scout vehicles used an Algol ID for the first stage. The Algol IIA was incorporated into the Scout System on February 1963 as shown in figure 2. The data of this motor is given in figure 11.

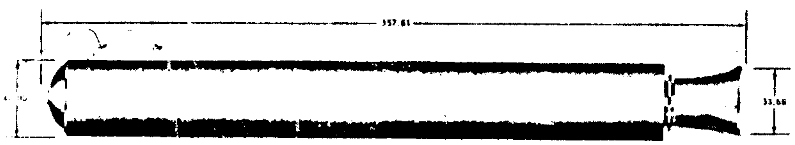
(b) The Castor rocket motor, present second-stage Scout propulsion unit, is manufactured by Thiokol Chemical Corporation, Redstone Division, Huntsville, Alabama. A new revised Castor II is being developed. The data of this motor is given in figure 12.

(c) The Antares rocket motor (X-259) was designed specially for the NASA Scout third stage by Allegheny Ballistics Laboratory (ABL), a U.S. Navy BuOrd facility operated by Hercules Powder Company, Cumberland, Maryland. The Antares X-259 is an improved version of the X-254 which was used on the original Scout vehicles. The X-259 was incorporated into the Scout System on March 1962 as shown in figure 2. The data of this motor is given in figure 13.

(d) The Altair rocket motor (X-258), Scout System upper-stage propulsion unit, is also manufactured by Allegheny Ballistics Laboratory and is described in figure 14. This motor has replaced the X-248 which was used on the original Scouts although the X-248 is available for the Scout vehicle when required by the payload user and is described in figure 15. The X-258 was incorporated in February 1963 as shown on figure 2.

6. GUIDANCE AND CONTROL:

The Guidance and Control System provides an attitude reference and the resultant control signals and forces necessary for stabilization of



ALGOL IIA

	Algol IIA
Total Impulse - Lb - Sec - Vacuum	5,469,084
Propellant Specific Impulse - Lb - Sec/Lb, Vacuum	258.92
Burning Time - Total - Sec	68.20
Weight - Total - Lb	23,610
Weight - Fuel - Lb	21,174
Mass Ratio - W_p/W_t	.897
Nozzle Expansion Ratio	7.32
Weight Consumed - Lb	21,458

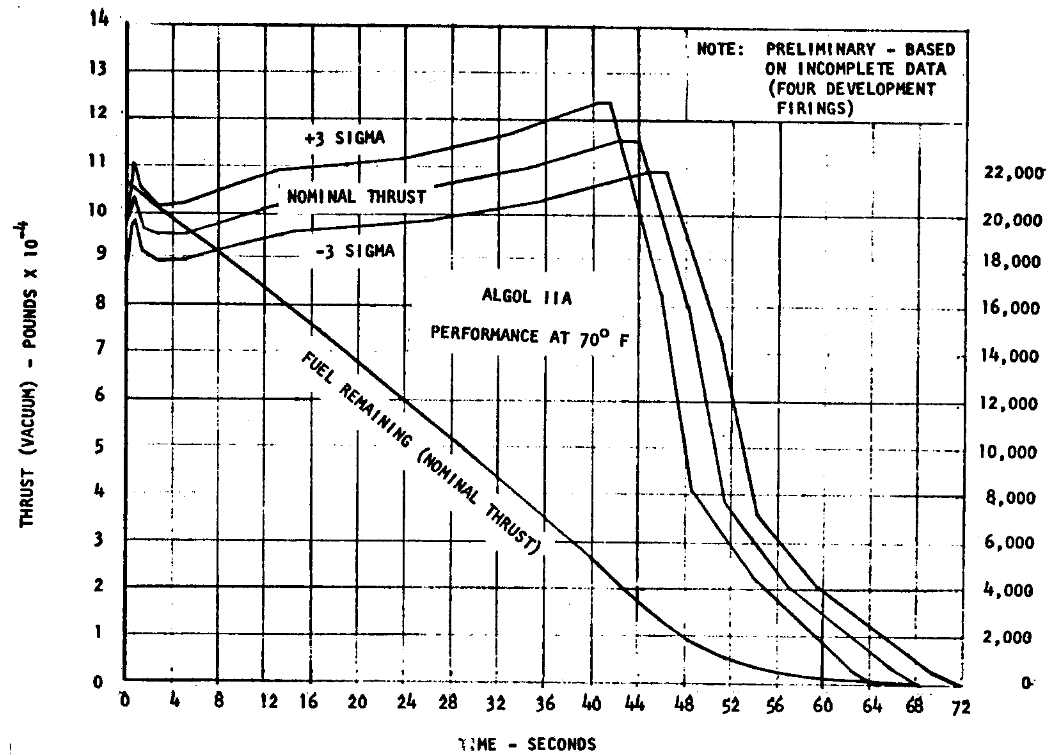
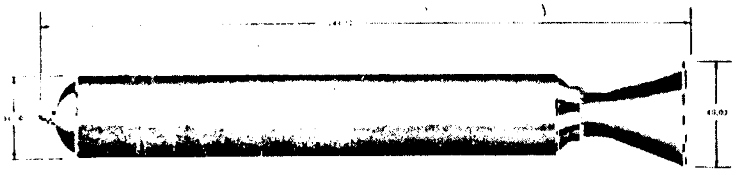


Figure 11. - Algol IIA



CASTOR I

	Castor I-E5
Total Impulse - Lb - Sec Vacuum	2,002,067
Propellant Specific Impulse - Lb - Sec/Lb, Vacuum	273.2
Burning Time - Total - Sec	42.5
Weight - Total - Lb	8,869
Weight - Fuel - Lb	7,328
Mass Ratio - W_p/W_t	.826
Nozzle Expansion Ratio	15.8
Weight Consumed - Lb	7,434

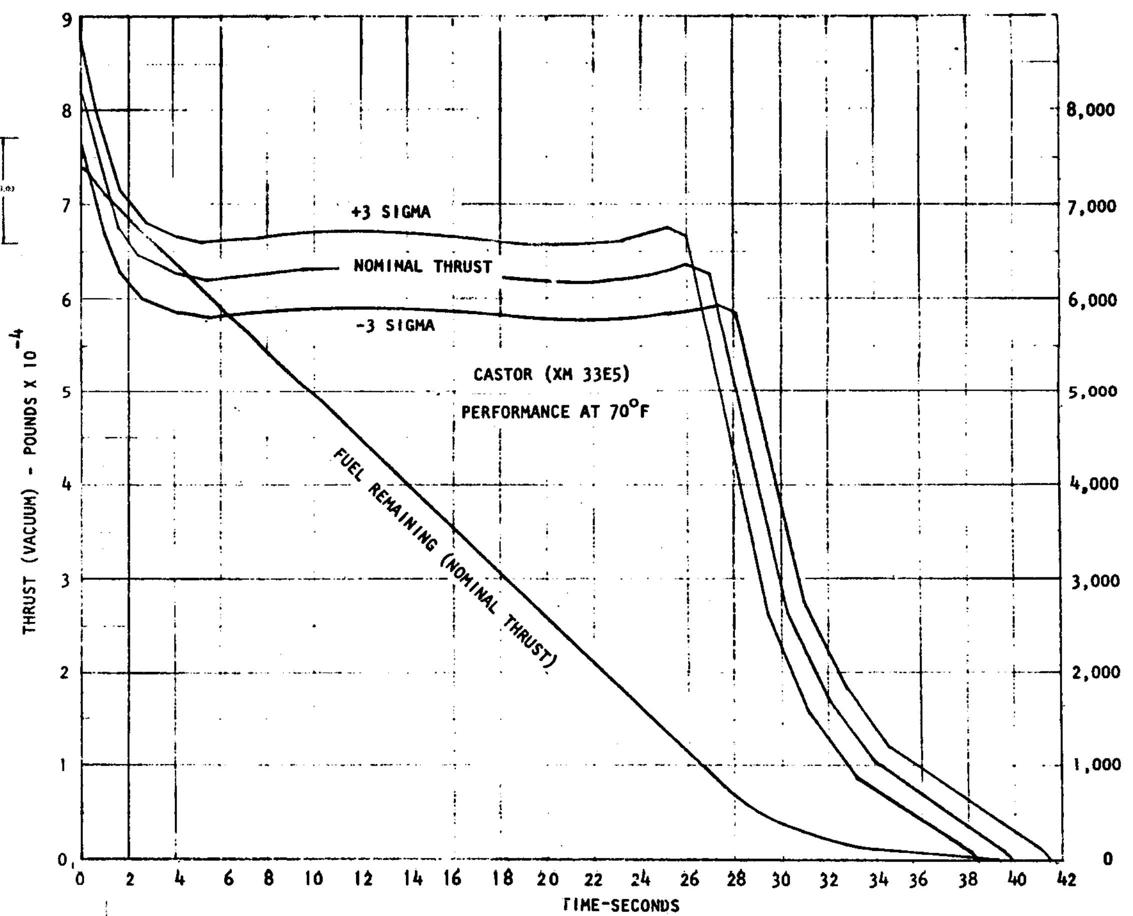
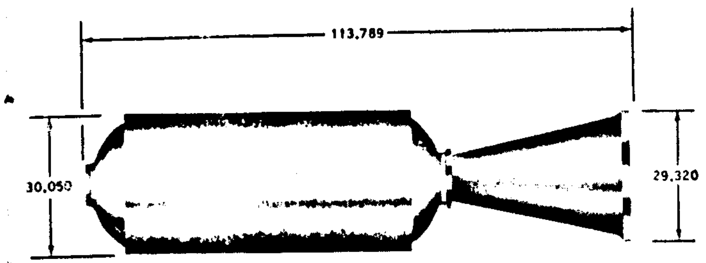


Figure 12.- Castor I



ANTARES X259

	Antares X259-A3
Total Impulse - Lb - Sec Vacuum	719,341
Propellant Specific Impulse - Lb - Sec/Lb, Vacuum	281.54
Burning Time - Total - Sec	36.30
Weight - Total - Lb	2,795
Weight - Fuel - Lb	2,555
Mass Ratio - W_p/W_t	.914
Nozzle Expansion Ratio	17.93
Weight Consumed - Lb	2,580

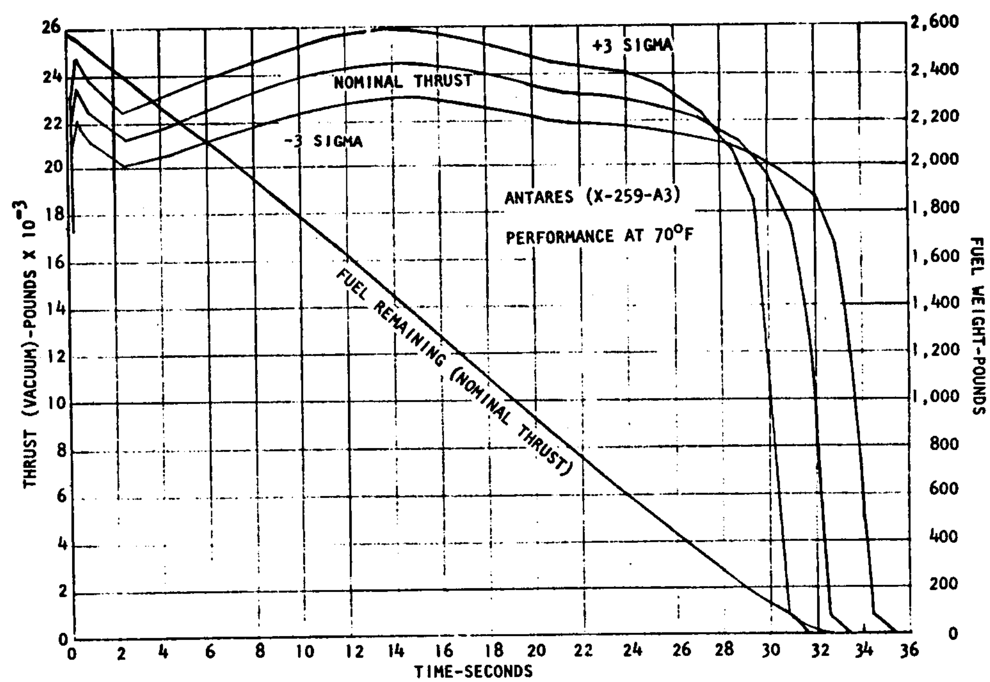
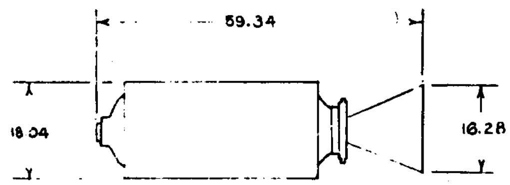


Figure 13.-Antares X259

2/11



ALTAIR X258

	Altair X258-A5
Total Impulse - Lb - Sec Vacuum	141,729
Propellant Specific Impulse - Lb - Sec/Lb, Vacuum	281.879
Burning Time - Total - Sec	26.0
Weight - Total - Lb	573
Weight - Fuel - Lb	503
Mass Ratio - W_p/W_t	.878
Nozzle Expansion Ratio	25.0
Weight Consumed - Lb	509

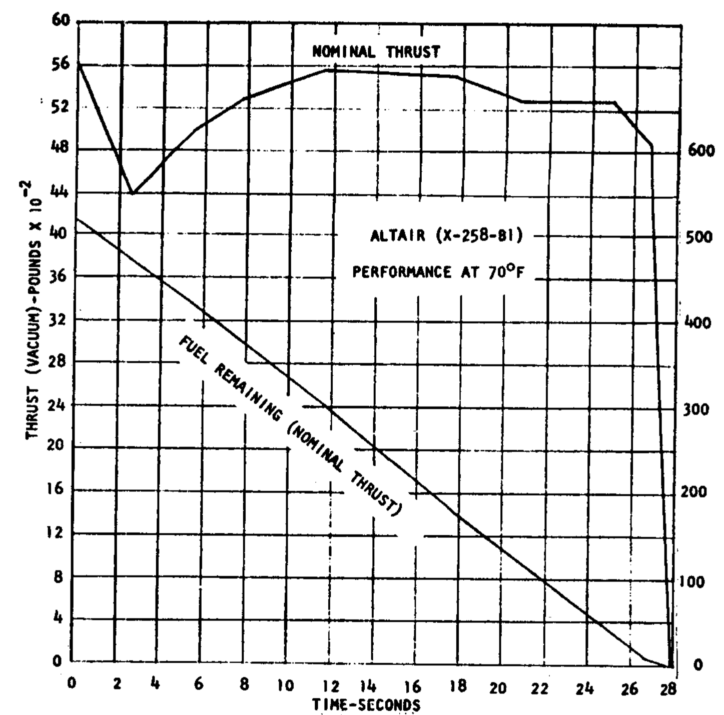
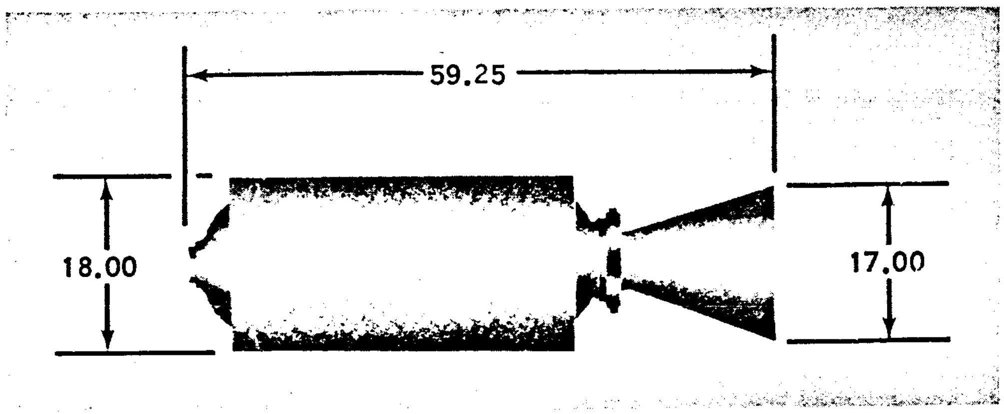


Figure 14.- Altair X258



ALTAIR X248

	Altair X248-A5
Total Impulse - Lb - Sec Vacuum	116,044
Propellant Specific Impulse - Lb - Sec/Lb, Vacuum	255.04
Burning Time - Total - Sec	41.4
Weight - Total - Lb	515
Weight - Fuel - Lb	455
Mass Ratio - W_p/W_t	.883
Nozzle Expansion Ratio	25.8
Weight Consumed - Lb	465

Figure 15.- ALTAIR X248

a vehicle in its three orthogonal axes corresponding to pitch, yaw, and roll during vertical probe, reentry, or orbital flight programs. Figure 16 illustrates the guidance and control systems.

The yaw and roll axes are maintained at the launch reference while the pitch axis is programmed through a preselected angle corresponding to the desired vehicle zero-lift trajectory. Miniature integrating rate gyros contained within the inertial reference package detect any angular deviation about the vehicle programmed path and generate proportional error signals. These error signals are then summed with corresponding rate signals and are transmitted to the appropriate control subsystem such that the vehicle is continuously programmed to the gyro reference axes.

In addition to the "strapped-down" gyro sensors, the system contains a relay unit for power and ignition switching, an intervolometer to provide precise scheduling of events during flight, a programmer to provide torquing voltages to the pitch gyro, an electronic signal conditioner to convert the gyro outputs to proper control signals, and the associated 400-cycle inverter and d-c batteries. Figure 17 illustrates the location of the controls.

(a) First Stage Controls: In the lift-off configuration, the vehicle is aerodynamically stable. A proportional control system featuring a combination of jet vanes and aerodynamic tip control surfaces operated by hydraulic servo actuators is used to control the vehicle throughout the entire first-stage burning period. The jet vanes provide the majority of the control force during the thrusting phase. The

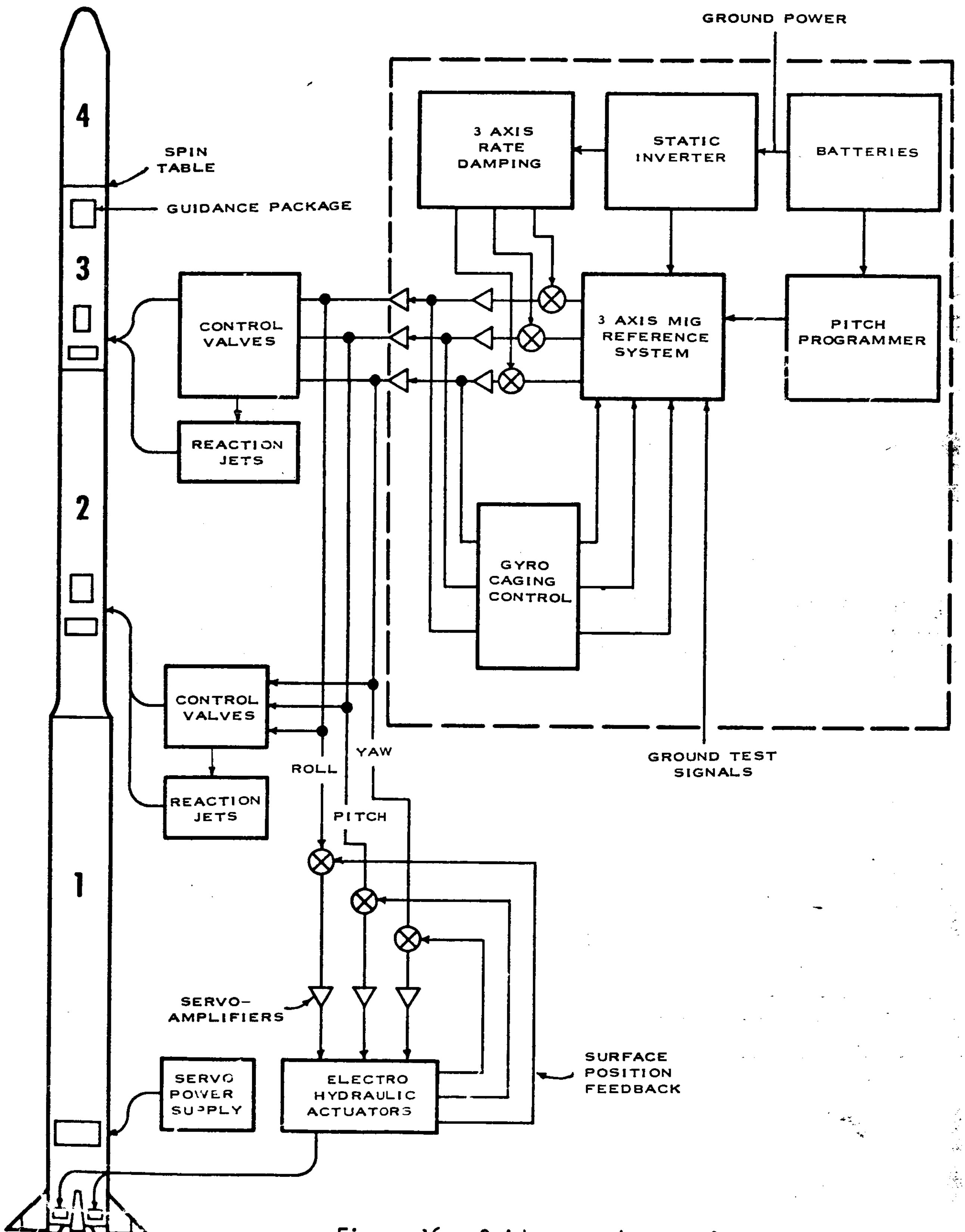


Figure 16.- Guidance and controls.

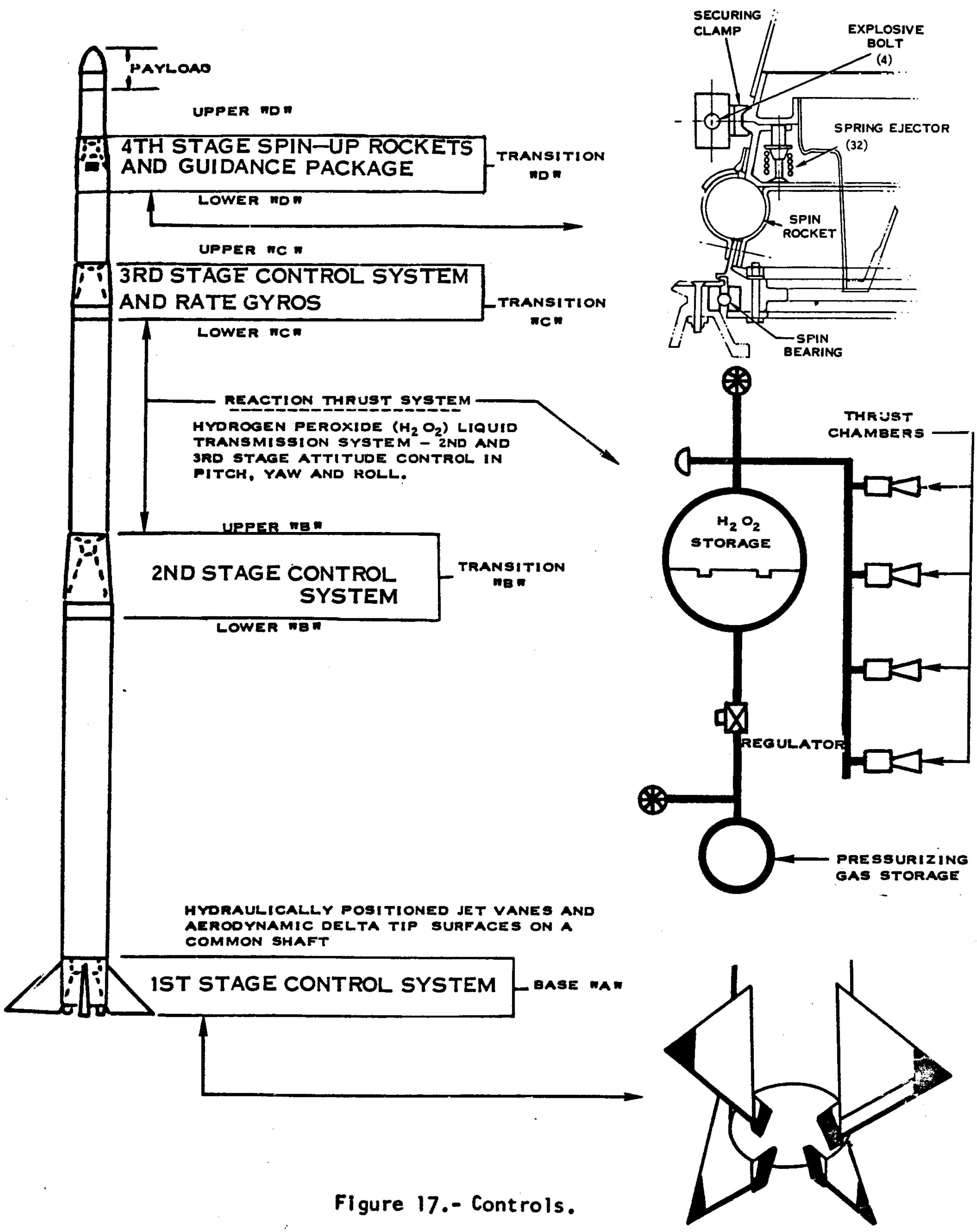


Figure 17.- Controls.

aerodynamic tip controls provide all the control force during the coasting phase following burnout of the first stage. Upper stage control systems detail follow.

(b) Second- and Third-stage Controls: Second- and third-stage control systems as sketched in figure 18 are based on the same concept of operations as the first stage but differ in the method used to generate the control force. The control forces for these two stages are provided by hydrogen peroxide reaction jet motors which are operated as an "on-off" system. The motors are so placed that moments are set up about each of the three axes: pitch, yaw, and roll. The motors are mono-propellant and utilize 90-percent hydrogen peroxide (H_2O_2). Propellant pressurization is provided by compressed nitrogen (N_2) gas. Design characteristics of the thrust motors and H_2O_2 tankage capacity are shown in table VII.

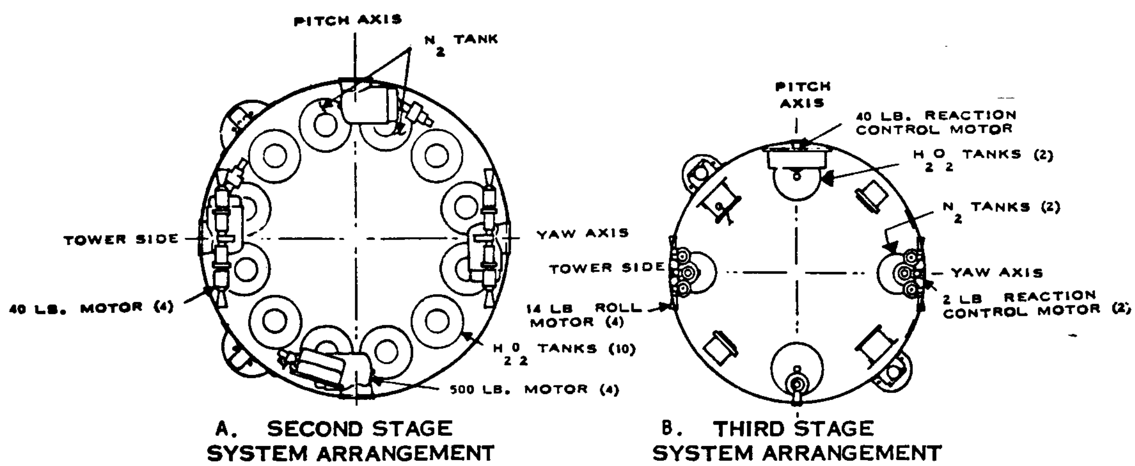


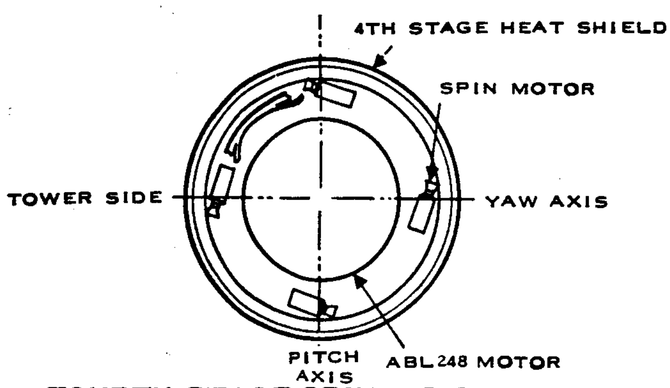
Figure 18.- Second and third-stage controls.

TABLE VII - GUIDANCE AND CONTROLS.

Design Characteristics	Second Stage	Third Stage
ROCKET MOTORS Thrust Levels	500-lb. Motor 510 ± 30 lbs Δ 490 ± 30 lbs ΔΔ 40-lb. Motor 46 ± 6 lbs 44 ± 4 lbs	40-lb. Motor 44 ± 4.4 lbs 14-lb. Motor 14 ± 1.4 lbs* 3 ± 1.0 lbs** 2-lb. Motor 2.2 + (0.8 - (0.4
Total Impulse 100% Duty Cycle Intermittent	25,560 lbs-sec. 21,300 lbs-sec.	2,560 lbs-sec. 2,240 lbs-sec.
Specific Impulse $\frac{lb_f - sec}{lb_m}$	500# - 155 40# - 165	40# - 154 14# - 170 2# - 160
Coast Time	Probe Orbital 5 sec. Re-entry 250 sec.	Probe Re-entry 20 sec. Orbital 600 sec.
Weight - lbs.	500# - 15.9 lbs max. ea. 40# - 2.4 lbs max. ea.	40# - 2.67 lbs. max. ea. 14# - 1.98 lbs. max. ea. 2# - 0.80 lbs. max. ea.
HYDROGEN PEROXIDE TANKAGE CAPACITY Total Impulse lb/sec 100% Duty Cycle	25,560	2,560
Specific Impulse $\frac{lb-sec}{lb}$	155	160
Weight Hydrogen Peroxide - lbs	178	17.8
Volume hydrogen Peroxide Tankage cu. in.	3840	384

Δ Condition No. 1. Pitch or yaw and two (2) roll motors operating
ΔΔ Condition No. 2. Pitch and yaw and two (2) roll motors operating
*Roll motor thrust control level during main stage engine burning
**Roll or yaw motor thrust control during vehicle coast

(c) Fourth-Stage Spin-up System: The fourth stage which includes the payload receives the proper spatial orientation from the control exerted by the first three stages after which it is spin-stabilized by a combination of four impulse spin motors. The miniaturized rocket spin motors are mounted tangentially in the skirt at the base of the fourth stage. Spin-up begins approximately 6 seconds prior to fourth-stage ignition. Spin motor arrangement and characteristics are shown in figure 19.



FOURTH STAGE SPIN–UP SYSTEM

SPIN MOTOR CHARACTERISTICS						
Operating Temperature	20°F		70°F		130°F	
	1KS40-HA	.6KS40-HA	1KS40-HA	.6KS40-HA	1KS40-HA	.6KS40-HA
Thrust Vacuum, Pounds	46	42.7	46	44.4	52	50.8
Burning Time, Seconds	1.06	0.70	1.09	.66	0.96	.659
Total Impulse Vacuum, lb-sec.	52	29.9	53	29.3	53	30.0

Figure 19.- Fourth-stage spin-up system.

7. STAGE SEPARATION:

The Scout vehicle four solid-propellant rocket motors are joined by interstage structures referred to as "transition sections" as described in section 4(a) and 4(b). Each transition section is divided into upper and lower portions at the stage separation plane. Frangible "blow-out" diaphragms (figure 20 A.) join the first and second, and the second and third stages. The diaphragm forms an internal clamp by the threaded periphery that engages two structural threaded rings at the separation plane. Blast pressure of the upstage motor ruptures the diaphragm, disengaging the periphery and allows the stage to separate. The third and fourth stages are joined by a "cold-separation" arrangement of springs held compressed by a clamp retainer flange (figure 20 B.) Explosive bolt clamps release the flanges, effecting separation by spring loaded ejection force. Section E is also separated by this method.

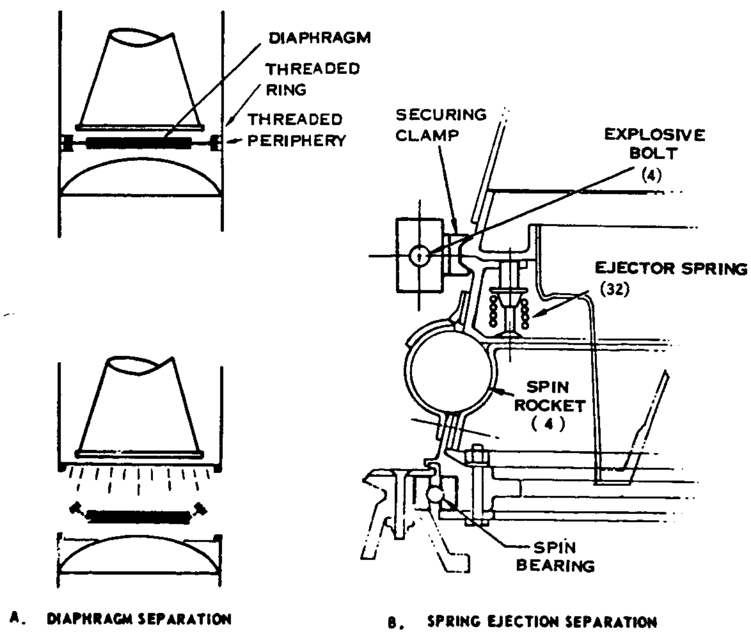


Figure 20.- Stage separation.

8. ELECTRICAL:

The Scout Electrical Systems are shown in figures 21 and 22.

(a) Power and Ignition System: To achieve reliability, dualized ignition systems have been employed as illustrated in figure 21. Safety features have been designed into the systems to prevent accidental or premature firing of the rocket motors. Dual squibs are used in all igniters, where each one of the squibs is in a separate circuit and is connected to a separate battery so that an electrical component failure will affect only one circuit. Ignition of the first-stage motor is accomplished by a direct electrical signal provided by launch blockhouse command. Second-, third-, and fourth-stage ignitions are controlled by the guidance program timer. The system provides for the following firing sequence: first-stage ignition from blockhouse command, second-stage ignition, payload heat shield ejection, third-stage ignition, spin motors, fourth-stage separation, and fourth-stage ignition. The same primary power source is utilized by the ignition and the destruct systems.

(b) Destruct System: The Destruct System provides capabilities for positive thrust termination of the first three stages to avoid a live uncontrolled vehicle impacting on or near the ground launch facilities or in a populated area. The system provides two methods of destruct; the command method operated by RF link, and the automatic method utilizing lanyard and pressure-actuated switches. The system is dualized, using two parallel linear charges per motor which can be detonated by either of two separate dual safe arm units. The system may be armed or safed remotely from the blockhouse. Electrical safing is provided for ground operation. Destruct of the vehicle may be accomplished by

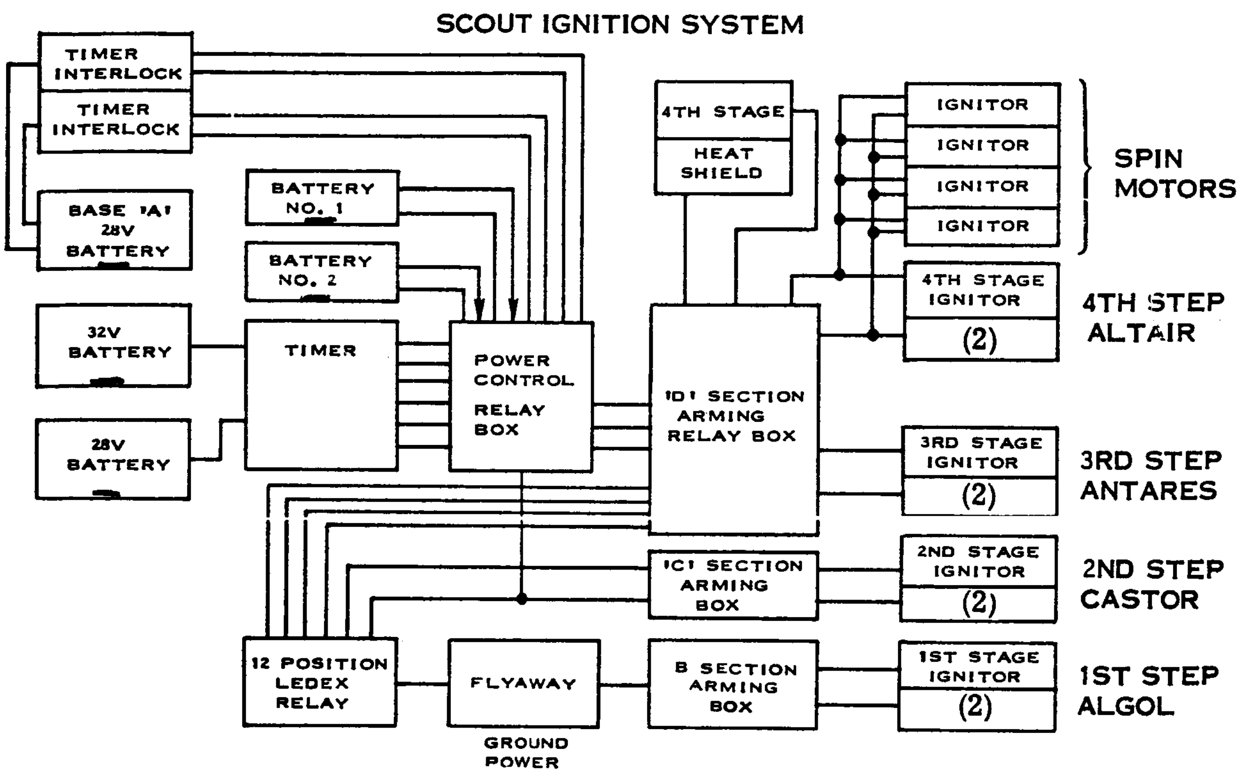


Figure 21.- Power and ignition system.

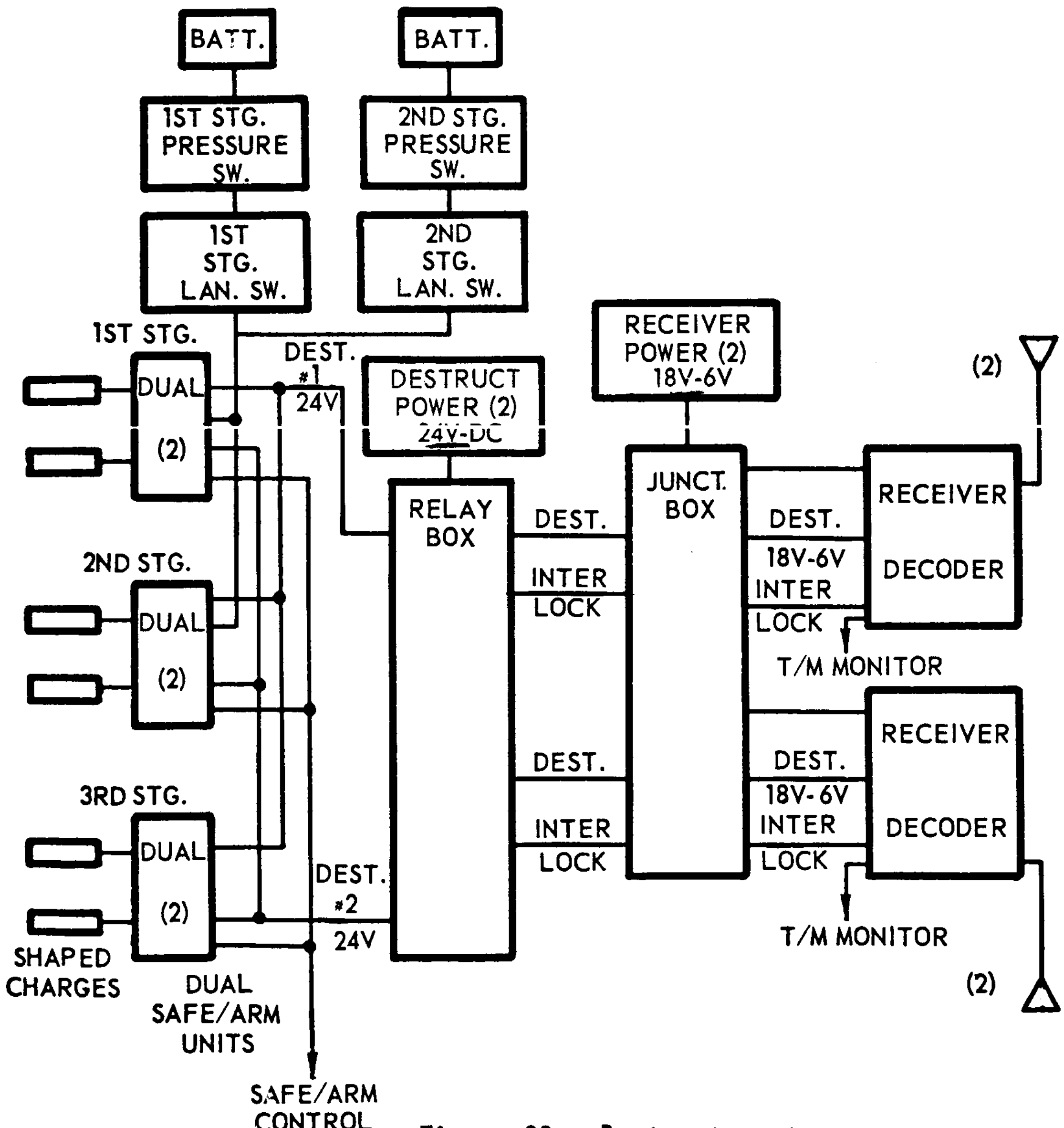


Figure 22.- Destruct system.

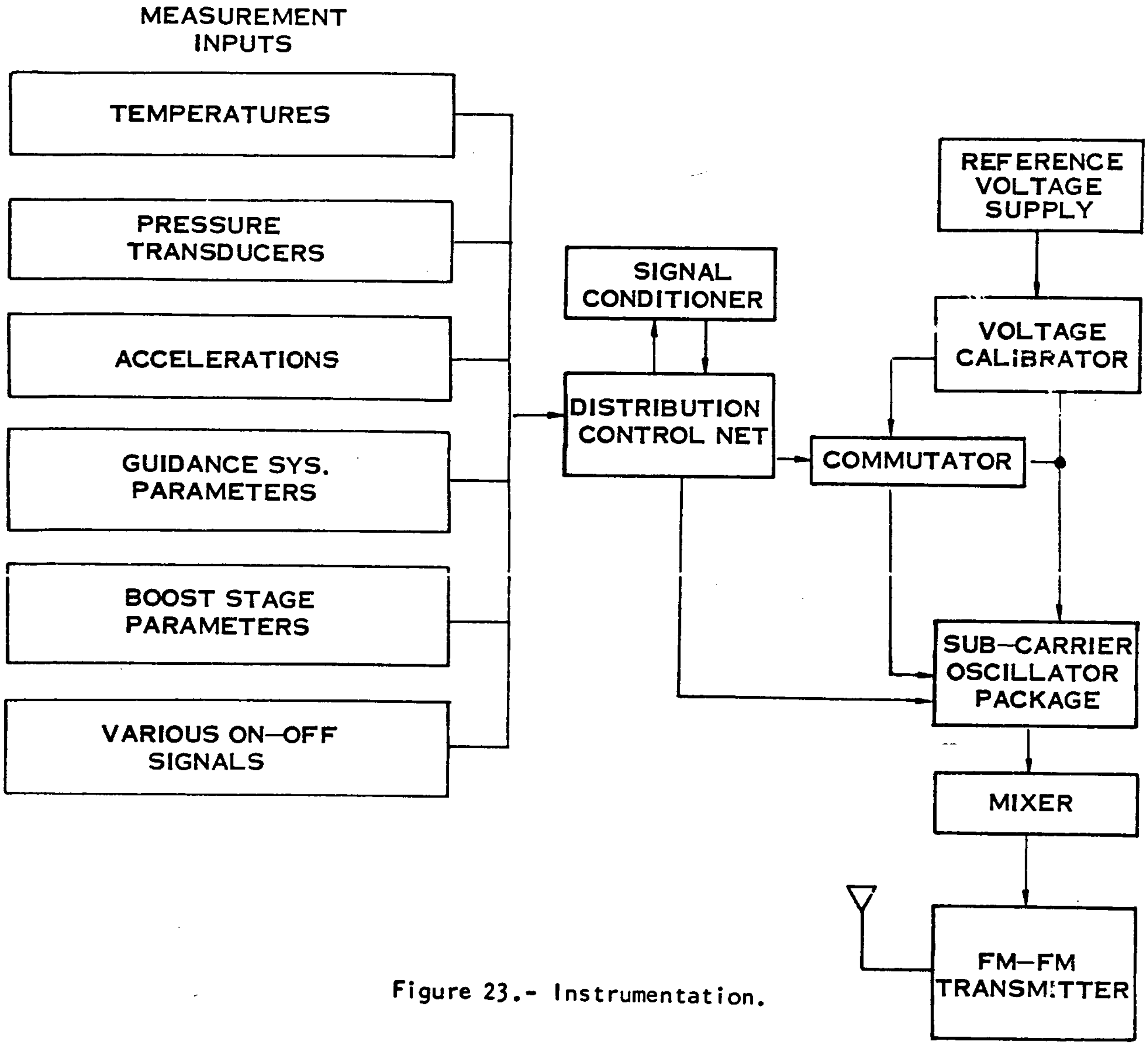


Figure 23.- Instrumentation.

RF link at the discretion of the range safety officer or by automatic link if the second stage separates prematurely during first-stage burning. Destruct capabilites for the payload can be incorporated if desired. A simplified diagram of the system is depicted in figure 22.

9. INSTRUMENTATION:

The instrumentation system for the Scout vehicle includes vehicle-borne equipment required to provide: ground monitoring of sub-systems during prelaunch checkout and countdown; telemetry monitoring of the flight performance of the first three stages; radar beacon tracking; and command destruct electronics for receiving and decoding of command destruct information. The telemetry is a 15-channel PAM/FM/FM system with 13 continuous FM/FM data channels and 2 commutated PAM/FM/FM data channels. Signal voltages for a number of measurements, both analog and "ON-OFF" types, are derived directly from basic components such as the guidance system, control system, and the destruct system. A simplified diagram of the system is depicted in figure 23.

10. TECHNICAL DATA REPORTS:

(a) The following reports have been contracted for and are available:

(A) Aerodynamic design data

(1) Stability and performance analysis data

(2) Structural design data

(B) Performance and trajectory

(C) Stress analysis

(D) Loads and dynamics

(E) Guidance system analysis

(F) First-stage control system analysis

(G) Weights

(H) Thermal protection analysis

(I) Reaction thrust systems

(J) Destruct system

(b) The following reports are received from the contractors with each vehicle.

(A) Preflight planning

(B) Postflight data

(C) Tracking radar data

(D) Meteorological data

(E) Vehicle performance telemeter records

(F) Radar data

(G) Vehicle log book

(c) The following reports are received from the contractors periodically.

(A) Informal technical letter (weekly)

(B) Technical progress (monthly and quarterly)

IV. Reliability and Quality Assurance Provisions

1. Purpose

The purpose of the Scout Reliability and Quality Assurance Program is to assure attainment of specified inherent reliability goals for the vehicle system and to further assure that operational reliability is maintained throughout the Scout program. The vehicle systems flight reliability objective is 0.90 as defined by the Flight Success Ratio.

2. Plans

The Scout Project Office through periodic reports prepared by contractor, by maintaining continuous review of reported equipment malfunctions and continuous design review, assesses the Scout system reliability. In order to provide the necessary information to enable the Project Office to maintain this close surveillance, the items listed in item 3 are available.

3. Principal Elements

(a) Program Plan (Reliability)

(b) Reliability Analysis and Reports

- (A) Ignition System
- (B) Destruct System
- (C) Guidance and First-stage Control System
- (D) Reaction Thrust System
- (E) Instrumentation and T/M System
- (F) Mechanical System (Heat Shields and Fourth-stage Separation)

(c) Periodic Reliability Status Reports

(d) Environmental Test Program

(e) Test Reports (Component FAT)

(f) Quarterly Progress Review Meetings

(g) Qualification Status Report (Summary of Status and History Files)

(h) Reliability Data Reporting (Malfunction Reporting System

(i) Continuous Design Review

(j) Continuous Monitoring by NASA

4. Application

The Quality Assurance, reliability, and environmental test programs that are programmed with the vehicle prime contractor were first included in amendment 18 of contract NAS1-1295. This replaces the temporary reliability program of contract NAS1-900. The [illegible] design goals for the Scout systems are itemized in table [illegible]. The reliability practices and activities to be accomplished under this program, in addition to preparation of this Reliability Program Plan, include the following items:

(a) Program Coordination

Reliability program coordination is provided to accomplish full-fillment of the Reliability Program Plan, to monitor and report progress of the reliability program and provide data for the NASA and Ling Temco Vought management decisions. Quarterly Reliability progress review meetings are held as scheduled by the NASA Scout Project Office. Monthly Reliability Status Reports are submitted to

TABLE VIII

ASSESSED DESIGN GOALS FOR SCOUT SYSTEMS

System	Reliability Design Goals				
	First Stage	Second Stage	Third Stage	Fourth Stage	System Stage
Propulsion					0.9606
Algol	0.9900				
Castor		0.9900			
Antares			0.9900		
Altair				0.9900	
Ignition	0.9999	0.9999	0.9999	0.9999	0.9996
Destruct	0.999997	0.999997	0.999997		0.99999
Mechanical					0.9973
Fins & Jet Vanes	0.9993				
Stage Separation Diaphragm		0.9999	0.9999	0.9999	
Spin Separation				0.9983	
Structural	0.999	0.9999	0.9999	0.9999	0.9987
Guidance (including 1st stage control)	0.9871	0.9951	0.9941		0.9765
Control		0.9972	0.9812		0.9784
Instrumentation					0.9950
Ground Systems					0.9950

Vehicle Reliability

$R_v = R_1R_2R_3R_4R_5R_6R_7R_8R_9$

$R_v = (.9606)(.9996)(.99999)(.9973)(.9987)(.9765)(.9784)(.9950)(.9950)$

$R_v = 0.9047$ (Probability of successful Scout flight) the Scout Project Office by Ling Temco Vought. Reliability program coordination is intended to assure that the required inherent reliability is designed into the vehicle system and that operational reliability is maintained.

(b) Reliability Analysis and Design Review

(A) Reliability Analysis - Quantitative reliability analyses are performed on the following systems:

(1) Ignition System

(2) Destruct System

(3) Guidance and First-stage Control System

(4) Reaction Thrust System

(5) Instrumentation and T/M System

(6) Mechanical Systems (Heat Shields and Fourth-stage Separation)

(7) GFE (monitoring and liaison only)

(B) Scope of Analysis - Parts population reliability analyses are being revised and up-dated as necessary on all systems listed above. Frequency-of-functional-failure analysis will be performed only on parts of systems deemed either to be marginal, or highly sensitive to this method of analysis and if a need for detailed analysis is indicated.

(C) Design Review - In order to assist in attaining apportioned reliability goals, reliability engineers review new and revised designs, drawings, and specifications and field/in-plant checkout procedures in coordination with design, manufacturing, checkout, and field operational groups. Basic design review activities to be performed as required to assure that reliability goals are met include:

(1) Informal Design Reviews

(2) Reliability Trade Studies

(3) Component Application Analysis

(c) Reliability Data Reporting

Reliability data is accumulated, evaluated, and reported by implementation of the following:

(A) Malfunction Reporting System - The malfunction reporting system currently in operation provides for reporting all malfunctions that occur during in-plant inspection and tests, assembly, preflight, and operations in the field for vehicle items and in-flight safety spares items, and also provides for recording followup and any corrective action taken. Data is processed into a punched card system to provide for maximum effectiveness in obtaining and reporting on corrective action, with emphasis on in-flight safety items for use on the next vehicle scheduled for launching.

Positive corrective action is taken on all failures reported. Following completion of the failure analysis, and/or determination of the cause of failure, the required corrective action taken is recorded.

(B) Reliability Status Report - In order to provide a periodic report of reliability status of the Scout vehicle systems, a status report is submitted monthly.

(d) Reliability Studies

(A) Reliability Assessments - Early in the NASA Scout design program, the reliabilities of the Scout vehicle and the vehicle systems were assessed. The purposes of these assessments were, firstly, to establish the feasibility of designing a vehicle of satisfactory reliability and, secondly, to establish the required reliability for each system and flight stage necessary to attain a desirable vehicle reliability. Subsequent studies have resulted in the revised vehicle systems assessments as presented in table VIII. Reliability programming endeavors to assist in attaining and exceeding the established goals. In assessing system reliability and establishing design goals, realistic appraisal of design feasibility considerations include these factors:

(1) Proposed system design characteristics

(2) System complexity

(3) Hardware state-of-the-art

(4) Operating environments

(5) Past experience with similar equipments and systems

(6) De-rating factors

(7) Flight duration

(8) Redundancy features

(9) Ease of operation

(10) Accessibility and maintainability

Reliability assessments of Scout systems yields a vehicle reliability of approximately 90 percent.

(B) <u>Design Review in a Reliability Program</u> - A reliability design review is an integral part of an overall reliability control program. The design review is an audit or evaluation of the logic and practicability of the basic design of equipment. It is being conducted on the initial design concept and on all changes thereto. The design review is a planned, continuous monitoring of the capability of the equipment to meet the expressed performance and reliability requirements of the equipment during operational use.

(e) Environmental Test Program

The Environmental Test Program reflects the test criteria and test program plans and is submitted to the NASA by the contractor for approval.

(f) Test Requirements

(A) Component Functional Tests - The items of table IX receive functional testing in accordance with the applicable LTV acceptance test specification. Data and reports for these items are maintained and provided to the same extent as for complete Flight Acceptance Testing except for environmental test data.

(B) Component Flight Acceptance Tests - Tests are performed on such safety-of-flight items as are listed in table X. Flight Acceptance Tests are performed on safety-of-flight items after which the requirements are reviewed with the NASA Scout Project Office for possible modification of component test requirements based on performance in the test program and in flight.

(g) Performance Criteria

(A) Pre-environmental Tests - The component or subsystem (i.e., test specimen) is subjected to a comprehensive evaluation of operating performance characteristics under standard conditions and a visual examination.

TABLE IX - COMPONENT DATA

Code No.	Name	Source	Part No.	Procurement Spec. No.	Location in Vehicle	No. per Vehicle
001	Electronic Inverter	M-H	DSG30A1	304-37	D Lower	1
002	Diode Unit	M-H	DDG93A1	304-38	C Upper	1
003	Poppet Valve Electronics	M-H	DEG211C3	304-40	D Lower	1
004	Servo Amplifier	M-H	DEG233C1	304-41	A	2
005	Programer	M-H	DRG87E1	304-325	D Lower	1
006	Intervalometer	M-H	DHG80B2	304-299	D Lower	1
007	Guidance Unit Assy	M-H	DGG122C3	304-326	D Lower	1
008	Rate Gyro Unit	M-H	DGG188A1	304-46	C Upper	1
009	Power Switching Relay Unit	M-H	DRG95A1	304-39	A	1
010	Hydraulic Servo Actuator	M-H	DMG109C1	304-327	A	4
011	Power Control Relay Box	TED	401-10380	-	D Lower	1
012	Radar Beacon	TED	401-01331	304-202	D Lower	1
013	Radio Command Receiver	Motorola	MCR-105	304-81	C Upper	2
014	Ignition Relay Assy	VAD	23-002564	-	D Lower	1
015	Ignition Relay Assy	VAD	23-002068	-	C Lower	1
016	Destruct Relay Assy	VAD	322-30115	-	C Upper	1
017	Destruct J-Box Assy	VAD	23-000397	-	C Upper	1
018	Solenoid Operated Rotary Switch	Ledex	23-002069	304-133	D Lower	1
019	FM/FM Transmitter	TDI	1009	304-61	D Lower	1
020	Relay Junction Box Transition C	TED	401-10018	304-56	C Upper	1
021	Solenoid Operated Rotary Switch	OAK	652739-100	304-76	D Lower	2
022	Mixer Amplifier	TDI	1170	304-64	D Lower	1
023	PAM Commutator Switch	GDI	9100-13	304-66	D Lower	1
024	Millivolt Subcarrier Oscillator	TDI	1284F	304-78	D Lower	1
025	DC Regulated Power Supply	EMP	PS-161	304-68	D Lower	1
026	DC-DC Converter	EMP	PS-137	304-70	D Lower	1
027	Resistor Box	CVC	23-002562	-	34" Heat Shield	1
028	Resistor Box	CVC	23-002569	-	25" Heat Shield	1
029	Resistor Box	CVC	23-002570	-	25" Heat Shield	1
030	Resistor Box	CVC	23-002698	-	D Upper	2
031	Filter	CVC	23-002678	-	D Lower	1

TABLE X - COMPONENT FLIGHT ACCEPTANCE TEST

Environments and Vehicle Effectivity

Component	Component Code No. See Table IX	FAT Requirements (See environmental code below)	Vehicle Effectivity
Electronic Inverter	001	3	130-162
Diode Unit	002	3	130-162
Poppet Valve Electronics	003	3	130-162
Servo Amplifier	004	3	130-162
Programer	005	3	130-162
Intervalometer	006	3	130-162
Guidance Unit Assembly	007	3	130-162
Rate Gyro Unit	008	3	130-162
Power Switching Relay Unit	009	8	130-162
Hydraulic Servo Actuator	010	8	130-162
Power Control Relay Box	011	3	130-162
Radar Beacon	012	5	130-162
Radio Command Receiver	013	4	130-162
Ignition Relay Assembly	014	7	130-162
Ignition Relay Assembly	015	7	130-162
Destruct Relay Assembly	016	7	130-162
Destruct J-Box Assembly	017	7	130-162
Solenoid Operated Rotary Switch	018	7	130-162
FM-FM Transmitter	019	2	130-162
Relay Junction Box Transition C	020	7	130-162
Solenoid Operated Rotary Switch	021	5	130-162
Mixer Amplifier	022	4	130-162
PAM Commutator Switch	023	4	130-162
Millivolt Subcarrier Oscillator	024	4	130-162
DC Regulated Power Supply	025	4	130-162
DC-DC Converter	026	4	130-162
Resistor Box	027	6	130-139
Resistor Box	028	6	130-139
Resistor Box	029	6	130-139
Resistor Box	030	6	130-139
Filter	031	8	130-139

Environmental Test Code: The above components shall be tested to the environments as specified below:

1 Low Temperature, Temperature Shock, Temperature-Altitude, Shock, and Vibration.
2 High Temperature, Temperature-Altitude, Shock, and Vibration.
3 Temperature-Altitude, Temperature Shock, and Vibration.
4 High Temperature, Shock, and Vibration.
5 Temperature-Altitude, Shock, and Vibration.
6 Temperature Shock, Shock, and Vibration.
7 Shock and Vibration.
8 Vibration.

(B) Environmental Tests - The test specimen is tested in a mode similar to that in which it is during the exposure of the component or subsystem to the actual environment which is being simulated.

(C) Post-environmental Tests - The performance evaluation tests performed as designated in 4.(g)(A) are repeated and the data taken must compare satisfactorily to that previously obtained. The visual examination is repeated and an internal examination is performed as practicable.

(h) Failure, Corrective Action, and Retest

(A) Failure - Components or subsystems failing Flight Acceptance Test are rejected and corrective action is taken.

(B) Corrective Action - An analysis of the failure is made to determine the cause of failure. If the failure is due to a faulty material or workmanship, the item may be repaired and/or readjusted. Repair may consist of replacing a defective part and taking quality control measures to prevent recurrence.

5. Motors

The solid propellant motors used on the Scout vehicle will be under a Quality Assurance program utilizing the NASA NPC 200-1-3 guidelines. The quality assurance of the motors has been defined in two programs. Phase 1 consists of Receiving Inspection and LRC review of all reported deviations. The Langley Research Center motor review board will recommend action on all major deviations. Phase 2 consists of the application of the NASA 200-1-3 as outlined in Motor Manuals which includes:

(a) Test and Inspection Procedures,

(b) Materials Specification List,

(c) Production Specifications,

(d) Performance Manual,

(e) Quarterly Quality Survey Audits, and

(f) Complete NASA drawing and documentation control.

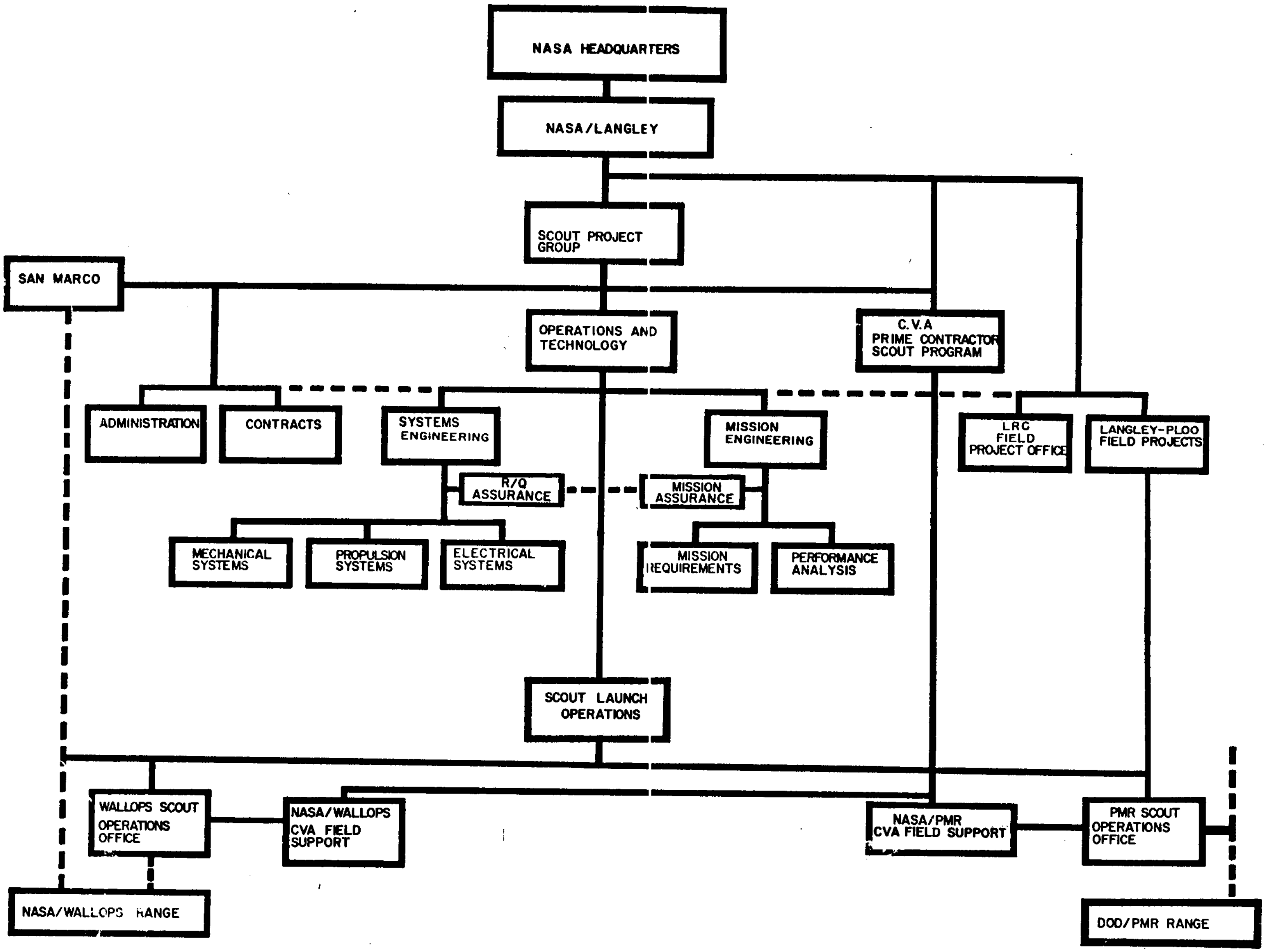


Figure 24.- NASA Scout Program Organization.

V. Management Plan

1. Assignment of Management Responsibility

(a) The Langley Research Center has been assigned project management responsibility for the Scout Vehicle Program. The overall project will be managed through the Scout Project Office.

(b) Ling Temco Vought Corporation of Dallas, Texas, has been awarded the task of "Vehicle Systems Prime Contractor."

2. Management Organization

(a) Figure 24 illustrates the management organization of the Scout Program at the Langley Research Center.

(b) Mr. E. D. Schult is Project Manager at the Langley Research Center (previously, W. F. Stoney and Col. G. R. Rupp). The project office is organized into the various offices as shown on figure 25, which also lists the responsibilities and functions of each office.

(c) Mr. W. Guild is Program Manager at Office of Space Sciences.

(d) The Langley Research Center Field Project Offices at PMR and Wallops Station as shown in figure 26 will be utilized by the Scout Project Office.

(e) The Prime Contractor's management organization is outlined in figure 27. The Contractor's Wallops field organization is shown in figure 28.

3. External Organizations

The Department of Defense, the AEC, and the Italian Government participate in the Scout programs. Appendixes A and B are the NASA/DOD agreements established for operation of the Scout Program.

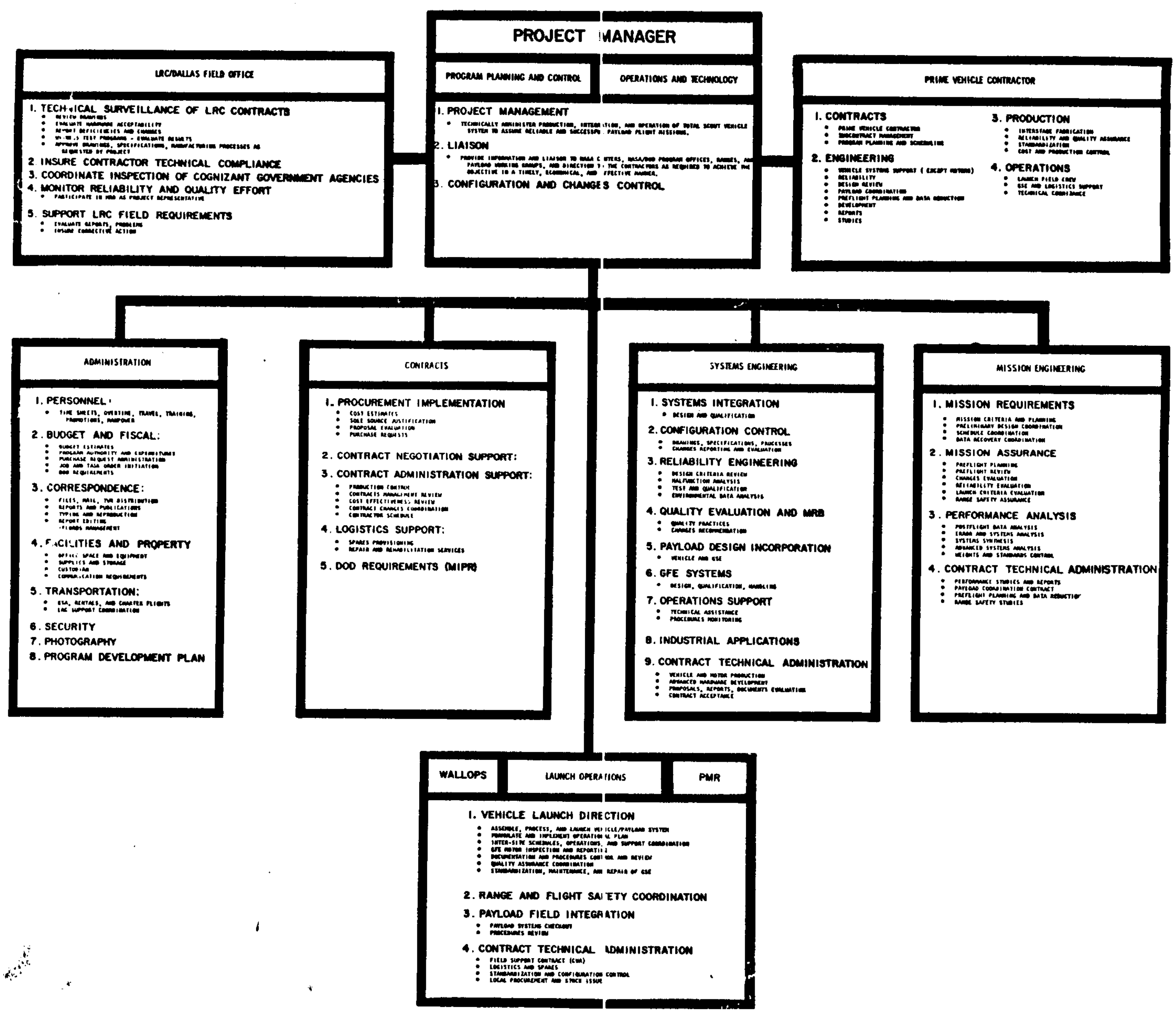


Figure 25.- Scout Project Responsibilities.

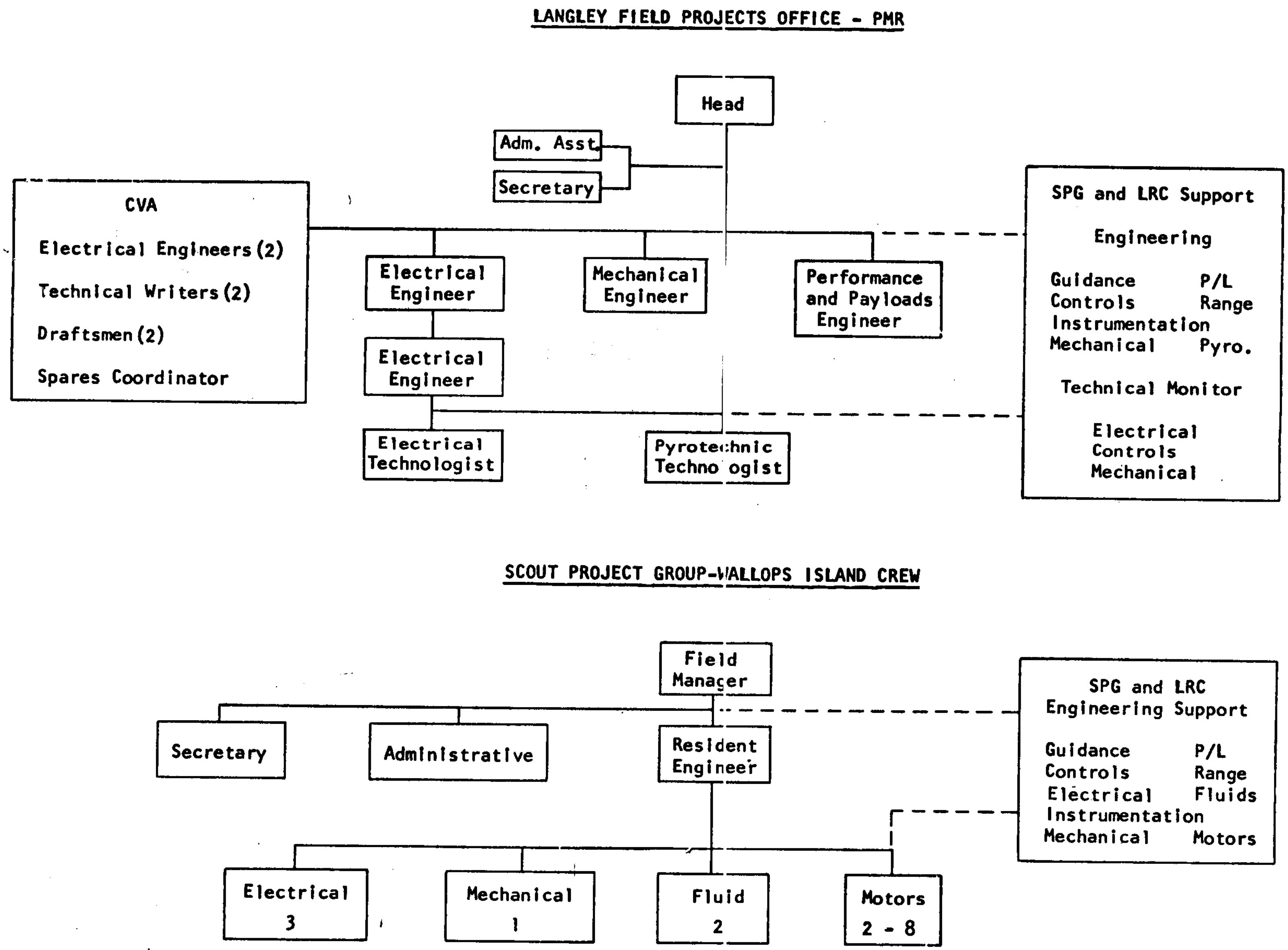


Figure 26.- Langley Research Center Field Project Offices at PMR and Wallops Station.

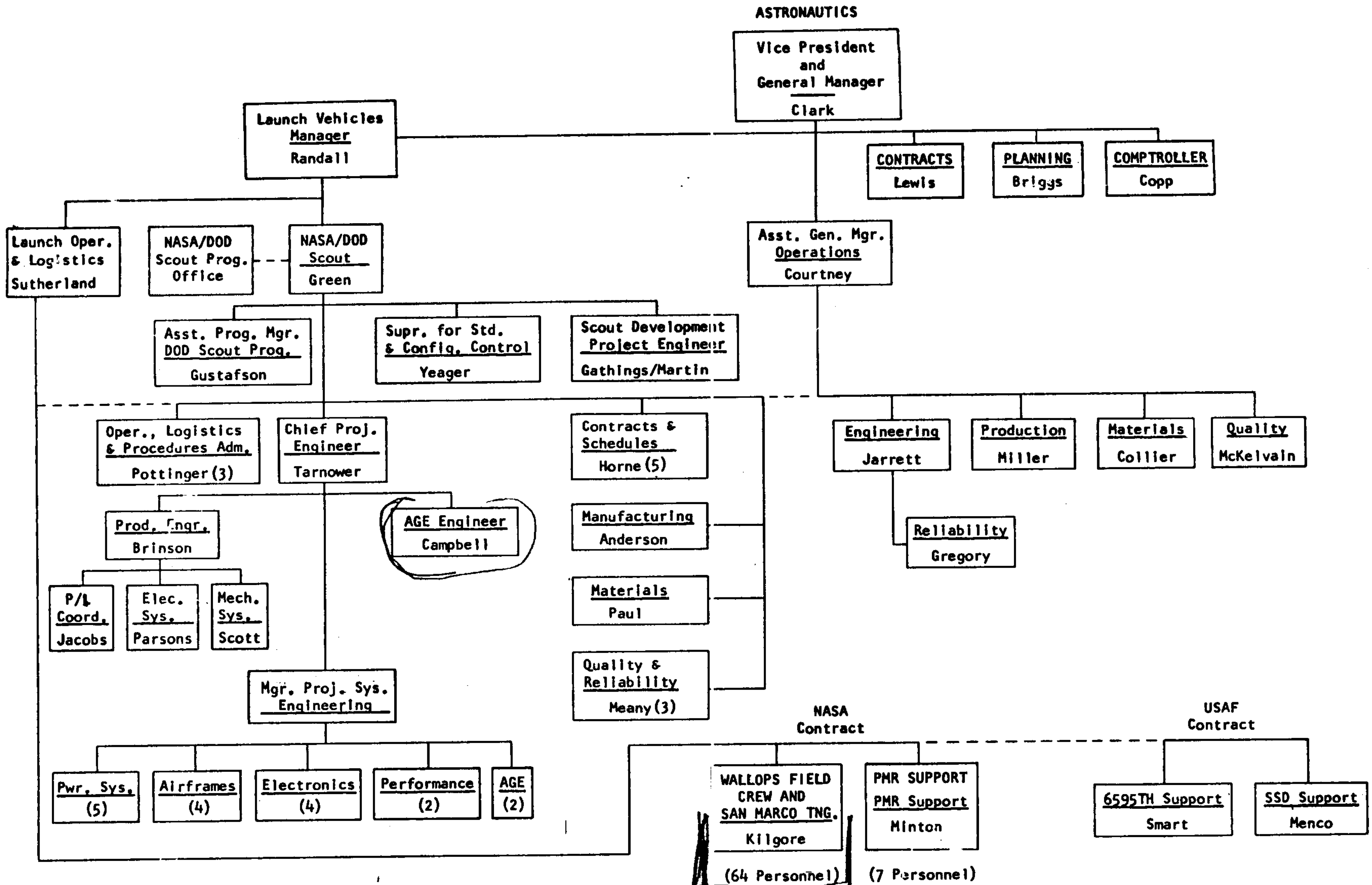


Figure 27.- Scout Chance-Vought Organization, 1963-1964

65

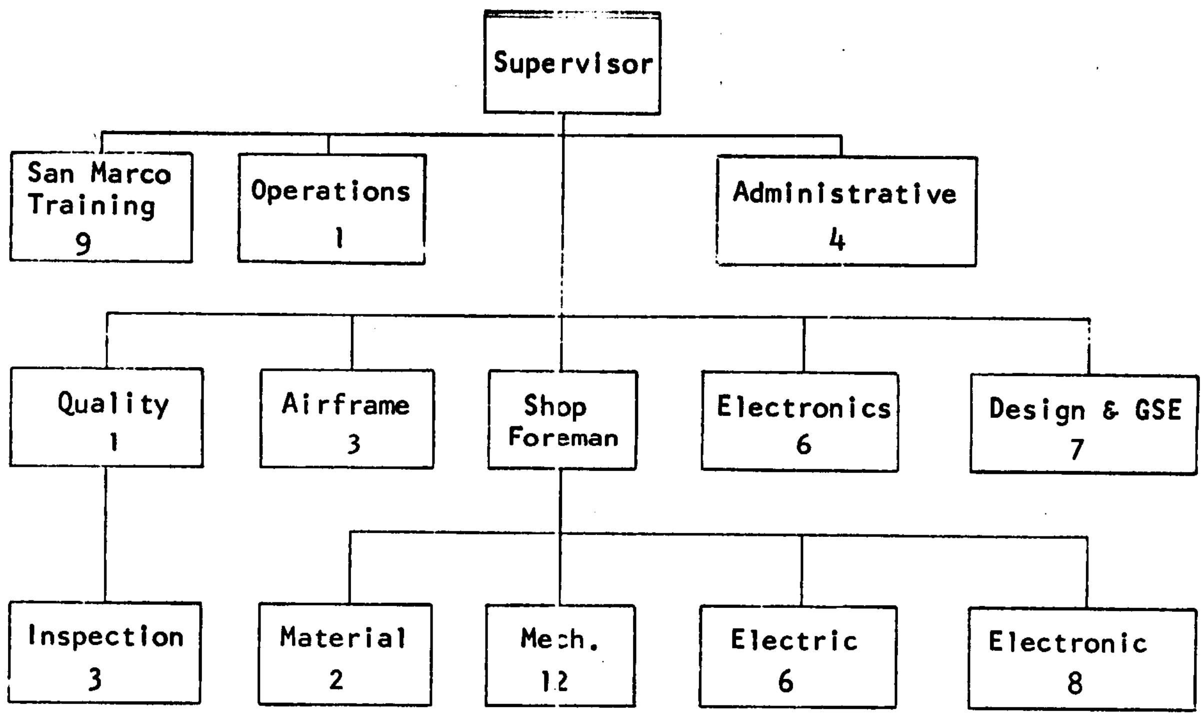


Figure 28.- Typical Scout CVC/WI Crew.

Figure 29 illustrates the NASA/DOD Scout system organization. An NASA Italian memorandum of understanding has also been established.

(a) Liaison with the Department of Defense is provided by SSD. Liaison with the Italian Government is provided by the NASA International Programs Office. AEC liaison is coordinated by the Office of Space Sciences.

4. Committees

(a) An NASA/DOD Coordinating Committee was set up in 1961 and meets as required. The relationship of this committee with the Scout program is shown in figure 29. At the meetings, all participants are brought up-to-date on the status of the project. All pertinent matters are discussed and minutes are prepared and distributed. The powers of the committee are included in appendix A.

(b) The present committee consists of:

Chairman: R. D. Ginter (Chief Small Vehicles, Code SV)
E. D. Schult (Head Scout Project Group)
Lt. Col. M. F. Gregg (Space Systems Division)
Commander W. L. Clark (Bureau of Naval Weapons)
Lt. Col. W. Goff (Air Force Systems Command)

5. International Requirements

The Scout will be used to launch payloads provided by the United Kingdom. The governments of France and Japan have shown interest in the Scout as a booster, and the Italian Government is making preparations to launch Scout vehicles near the coast of Africa.

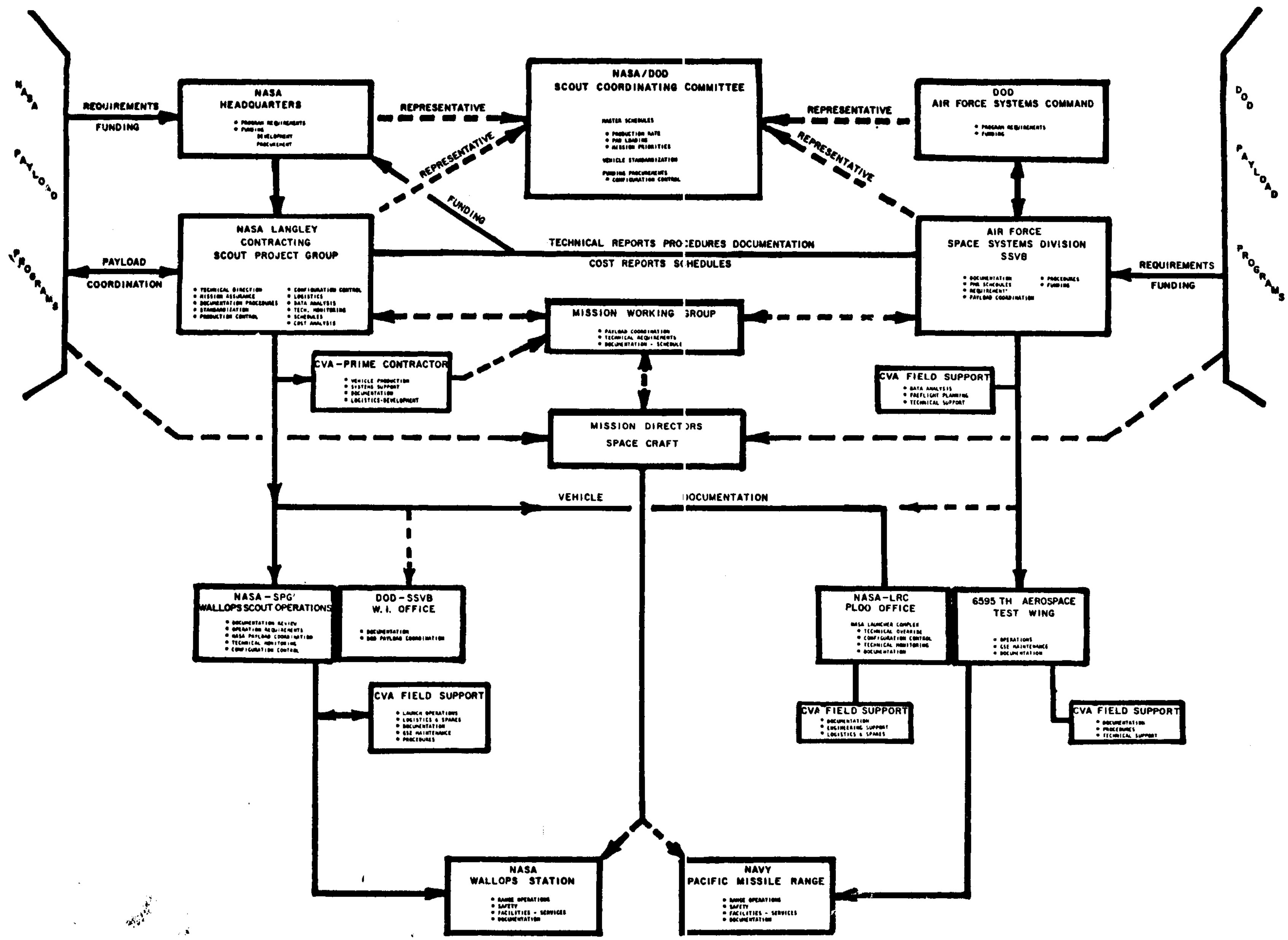


Figure 29.- NASA/DOD Scout System Organization.

VI. MANAGEMENT REPORTING

1. The following reports are received by Langley Research Center and Office Space Sciences (OSS) from the contractors:

TITLE	FREQUENCY
(a) Technical Progress Report	Monthly
(b) Financial Report	Monthly-Quarterly
(c) Manpower Utilization Report	Monthly
(d) Program Progress Report	Monthly
(e) Program Management Plan	Every 2 Weeks

2. The following reports are prepared by Langley Research Center:

(a) Financial Report to Washington Headquarters	Monthly
(b) Budget Report to Washington Headquarters	Annually
(c) Manpower Report to Washington Headquarters	Quarterly
(d) DOD Financial Status to OSS	Monthly
(e) Informal financial information to OSS	Monthly
(f) Photographs to Office Space Sciences (OSS)	As Required (example figure 30)

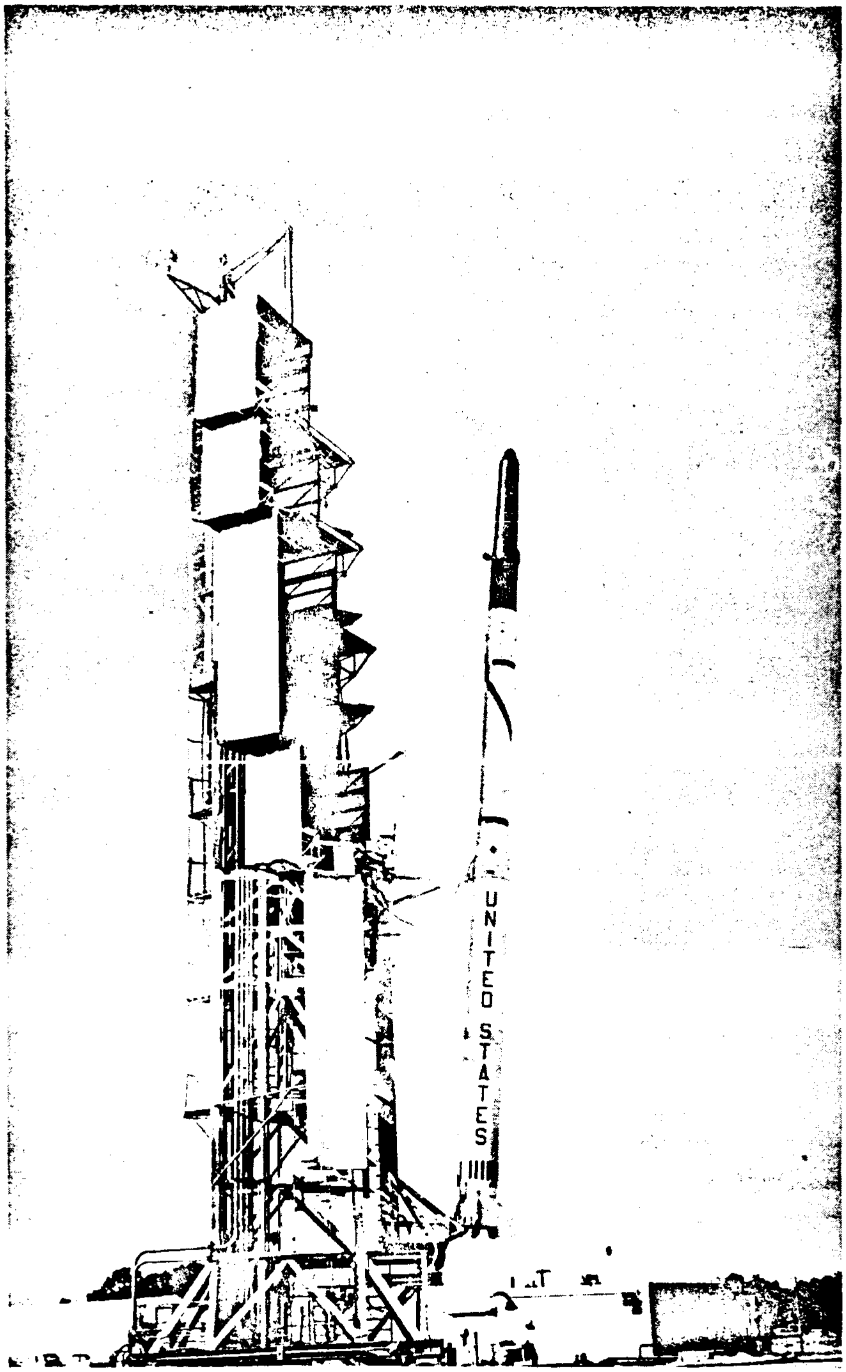


Figure 30 - First operational vehicle S-9 on launcher ready for take-off March 29, 1962. Launcher is shown as refurbished for environmental control.

VII. PROCUREMENT ARRANGEMENTS

1. CONTRACTORS:

As Itemized.

Hardware	Ling Temco Vought
First-stage Motor	Aerojet-General Corporation
Second-stage Motor	Thiokol Chemical Corporation
Third-stage Motor	Allegany Ballistics Laboratory
Fourth-stage Motor	Allegany Ballistics Laboratory or Navy Propellant Plant
Field Support	Ling Temco Vought
Logistics and Spares	Ling Temco Vought
Preflight Planning and Data Reduction	Ling Temco Vought
Sustaining Engineering	Ling Temco Vought
Range Safety	Ling Temco Vought

2. RESPONSIBILITY:

The Langley Research Center is responsible for the contracts pertaining to the Scout program. Contractual procurements are negotiated and administered in accordance with current management regulations. Mr. S. Butler is the contracting officer.

3. TECHNICAL MONITORING:

The techincal monitoring of these contracts is the responsibility of the Scout Project Office, Langley Research Center.

4. LOGISTICS AND SPARES:

The Scout Spares and Logistics program system is outlined in figure 31. The logistics program operational procedures are documented. Upon rece

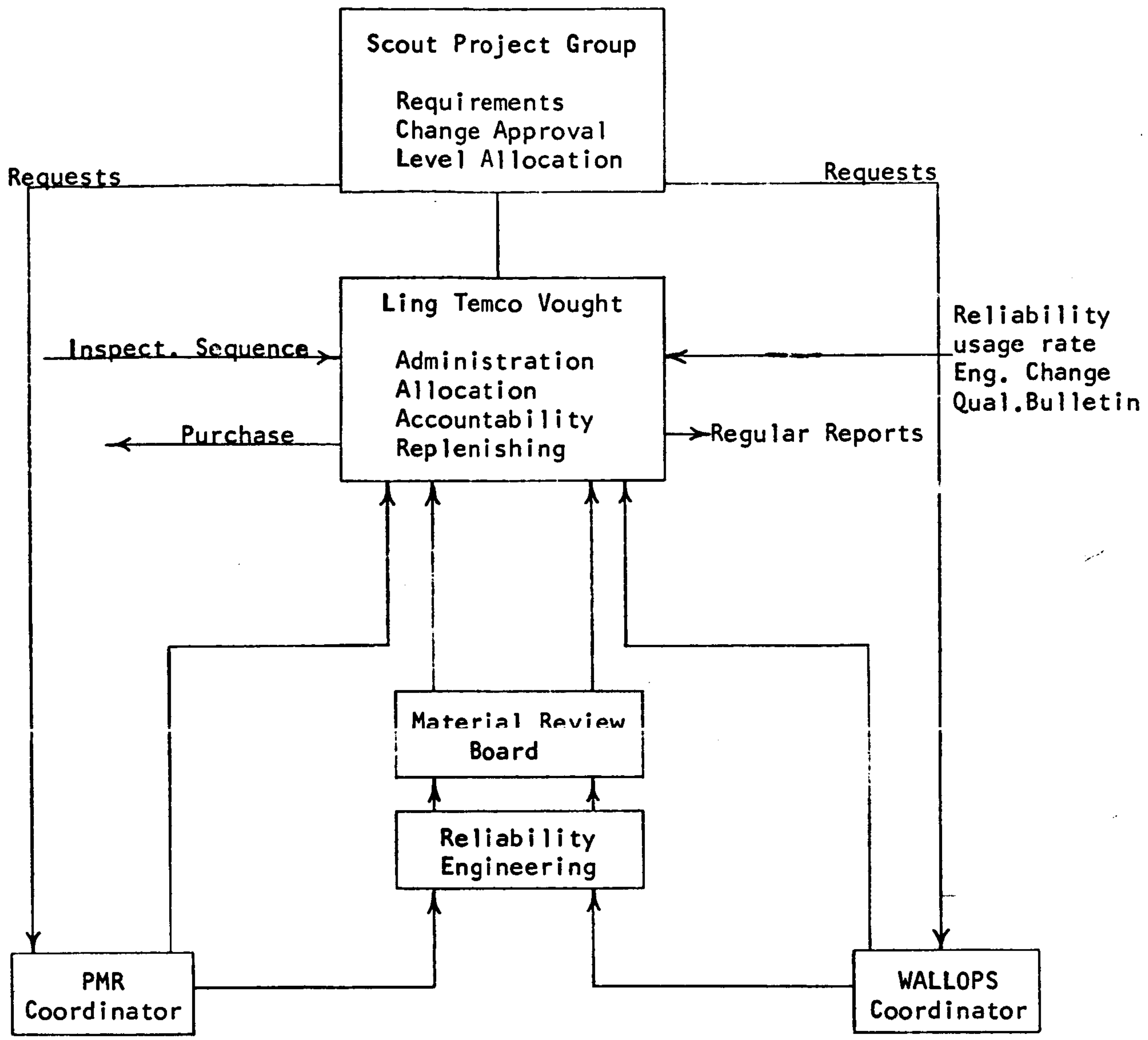


Figure 31.- Spares/Logistics Program.

of contractual authorization, purchase orders are released to vendors or for fabrication by the contractor. Incoming items from the vendor or individual departments of the contractor are received by the contractor, inspected, and flight-acceptance tested as required. The spares are kept in the Scout Spares Stores Area at Dallas, as well as at PMR and Wallops. Spares quantities at the off-site locations are maintained in accordance with the NASA approved distribution list. Items are added, deleted, or otherwise adjusted on the distribution list as required and approved by NASA. Items are assigned stores shelf space and posted in the inventory file. A perpetual inventory file is maintained as the items are received and/or shipped.

VIII. SCHEDULES

1. Program Management Plans

Key milestones for the accomplishment of the Scout Project are issued in the form of Program Management Plans. A summary example of the vehicles and launcher is shown in tables XI and XII.

The Scout distribution list of all official schedules is shown on page VIII-5.

PROGRAM MANAGEMENT PLAN

1-1-64

TABLE XI - SCOUT LAUNCH VEHICLE PROGRAM

CODE		MILE-STONE	CONTRACTOR	MILESTONE	STATUS	SCHD AS OF	0 02 63	10 16 63	10 30 63	11 13 63	11 27 63	12 11 63
07	00	01	LRC	NASA-1 VEH TEST	C	07 01 60						
07	00	02	LRC	NASA-2 VEH TEST	C	10 04 60						
07	00	03	LRC	NASA-3 VEH TEST & S-56	C	12 04 60						
07	00	04	LRC	NASA-4 VEH TEST & S-56A	C	02 16 61						
07	00	05	LTV	NASA-5 VEH TEST & S-55	C	06 30 61						
07	00	06	LTV	NASA-6 VEH TEST & S-55A	C	08 25 61						
07	00	07	LTV	NASA-7 VEH TEST & P-21	C	10 19 61						
07	00	08	LTV	NASA-8 VEH TEST & REENTRY	C	03 01 62						
07	00	09	LTV	NASA-9 P-21A	C	03 29 62						
07	00	10	LTV	NASA-12 REENTRY 3	C	07 20 63						
07	00	11	LTV	DOD SOLRAD	C	04 26 62						
07	00	12	LTV	USAF-1	C	05 24 62						
07	00	13	LTV	DOD - OPEN	C	06 28 63						
07	00	14	LTV	NASA-10 REENTRY 2	C	08 29 62						
07	00	15	LTV	NASA-11 S-55B	C	12 16 62						
07	00	16	LTV	AEC RFD-1	C	05 22 63						
07	00	17	LTV	USAF-2	C	08 23 62						
07	00	18	LTV	DOD	C	12 18 62						
07	00	19	LTV	DOD	C	04 05 63						
07	00	20	LTV	DOD	C	06 15 63						
07	00	21	LTV	USAF-4	C	04 26 63						
07	00	22	LTV	NASA-14 AIR DENSITY	Q	12 00 63						
07	00	23	LTV	NASA-15 S-48	Q							
07	00	24	LTV	AEC RFL-3	Q							
07	00	25	LTV	DOD	Q							

C MILESTONE COMPLETED
Q MILESTONE DATE IN QUESTION

NASA FORM 510 DECEMBER 1960

75

PROGRAM MANAGEMENT PLAN

1-1-64

TABLE XI, Continued - SCOUT LAUNCH VEHICLE PROGRAM

	PLAN	MILESTONE	CONTRACTOR	MILESTONE	STATUS	SCHED AS OF	10 02 63	10 16 63	10 30 63	11 13 63	11 27 63	12 11 63
07	00	26	LTV	USAF-3	C	02 19 63						
07	00	27	LTV	NASA-17 S-52	Q							
07	00	28	LTV	DOD	Q							
07	00	29	LTV	AEC RFD-2	Q							
07	00	30	LTV	UNASSIGNED								
07	00	31	LTV	UNASSIGNED								
07	00	32	LTV	UNASSIGNED								
07	00	33	LTV	UNASSIGNED								
07	00	34	LTV	USAF	Q							
07	00	35	LTV	USAF	Q							
07	00	36	LTV	USAF	Q							
07	00	37	LTV	UNASSIGNED								
07	00	38	LTV	UNASSIGNED								
07	00	39	LTV	UNASSIGNED								
07	00	40	LTV	UNASSIGNED								
07	00	41	LTV	UNASSIGNED								
07	00	42	LTV	UNASSIGNED								
07	00	43	LTV	UNASSIGNED								
07	00	44	LTV	UNASSIGNED								
07	00	45	LTV	UNASSIGNED								
07	00	46	LTV	UNASSIGNED								
07	00	47	LTV	UNASSIGNED								
07	00	48	LTV	UNASSIGNED								
07	00	49	LTV	UNASSIGNED								
07	00	50	LTV	UNASSIGNED								

C MILESTONE COMPLETED
Q MILESTONE DATE IN QUESTION

NASA FORM 510 DECEMBER 1960

PROGRAM MANAGEMENT PLAN

1-1-64

TABLE XII - SCOUT LAUNCH FACILITY WALLOPS ISLAND STATION
PROJECT 3624 SUMMARY CHART

		MILESTONE	CONTRACTOR	MILESTONE	STATUS	SCHD AS OF 09 18 63	10 02 63	10 16 63	10 30 63	11 13 63	11 27 63	12 11 63
75	00	01		TRANSPORTER								
75	00	02		FABRICATE	C	07 15 63						
75	00	03		SHIP	C	08 08 63						
75	00	04		SHELTER								
75	00	05		FABRICATE	C	05 11 6						
75	00	06		SHIP	C	06 01 63						
75	00	07		LAUNCHER								
75	00	08		ENGINEERING	C	03 30 63						
75	00	09		FABRICATE, TEST, SHIP	C	08 04 63						
75	00	10		ERECTION	C	08 31 63						
75	00	11		MECHANICAL GSE								
75	00	12		DELIVERY		09 15 63						
75	00	13		E & E GSE								
75	00	14		DELIVERY	C	07 19 63						
75	00	15		INSTALLATION, TEST, CHECKOUT								
75	00	16		START	C	06 22 63						
75	00	17		COMPLETE		11 02 63						
75	00	18		LAUNCH SITE PREP.								
75	00	19		COMPLETE		09 15 63						

C MILESTONE COMPLETED
O MILESTONE DATE IN QUESTION

September 18, 1963

2. Distribution List for Project Scout

HEADQUARTERS

Dr. Dryden	AD	Mr. Lewis	BF	Mr. Slusser	PM (4)	Mr. Glahn	SV
Dr. Seamans	AA	Mr. Barber	BRM	Mr. Bowman	PR	Dr. Morrison	SV
Adm. Boone	AAD-3	Mr. Einhorn	BU (2)	Dr. Bisplinghoff	R	Mr. Ginter	SV
Mr. Enders	A-5	Mr. McNamara	BU	Dr. Kelley	RE	Mr. Galvin	T
Mr. Hyatt	AE	Mr. Koppenhaver	PE	Mr. Wood	RV	Col. Pozinsky	T
Mr. Young	B	Mr. Ulmer	PF	Mr. Crocker	SP	Mr. Futch	PMC(7)

GODDARD SPACE FLIGHT CENTER

Mr. Wasielewski	101
Mr. Mandeville	262
Mr. Lucas	264
Mr. South	533

SPACE SYSTEMS DIVISION, AFSC
Air Force Unit P. O. Los Angeles 45, Calif.

lt. Col. M. F. Gregg SSVB (4 copies)

HEAD S/C OPERATIONS SECTION
FIELD PROJECTS BRANCH, GSFC-AMR
P. O. Box 425, Lompoc, California

LANGLEY RESEARCH CENTER

Eugene D. Schult	Mr. L. C. Richardson
Mr. F. Thompson	Mr. T. A. Harris (2)
Mr. Ben Bland	Mr. E. Draley
Mr. Halissy	Mr. E. Hastings
Mr. E. C. Kilgore	Maj. J. Samos, (AFSC Liaison)

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Box 5907, Dallas 22, Texas

Mr. S. W. Randell, Jr. (Proj. Mgr, Booster Div.) (4 copies)

LEWIS RESEARCH CENTER

Mr. J. Walker (Rm 212, Bldg. ERB)

Program Manager: W. Guild (SV)
Project Manager: E. D. Schult (Langley)

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IX. RESOURCE REQUIREMENTS

1. MANPOWER:

The Scout Project Office was officially organized by the Langley Research Center Director on February 29, 1960. Ten engineers and a secretary were assigned to the office. In addition, 15 personnel at other Langley Research Center divisions were appointed to represent their divisions on matters pertaining to support of the Scout Project Group. In fiscal year 1961 three additional personnel were assigned to the project office. An average of approximately 100 direct personnel throughout the Langley Research Center were involved in the Scout Project from its peak in 1959 to the present time as shown in table XIII. Table XIII does not include any manpower numbers for the San Marco project which is managed by the Scout Project Office. The Scout Project Office is also assigned the responsibility of other projects such as motor procurement and management of the solid motors used on programs such as Wasp, Delta, Fire, Beanstalk, 609A, Blue Scout Junior, AEC, and ESD; the PMR launch site, and the San Marco project. The Scout Project Office also has personnel assigned to the payload mission working group which is organized as follows:

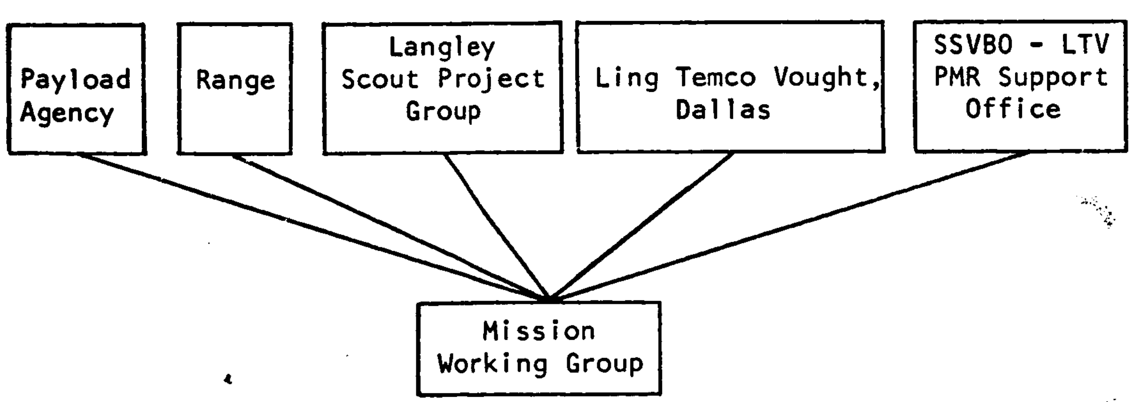


TABLE XIII - SCOUT MANPOWER REQUIREMENTS (Langley Research Center)
MAN-YEARS (Fiscal)

	FY1958	FY1959	FY1960	FY1961	FY1962	FY1963	FY1964
Development							
Vehicle	4	70	70 (7)	50 (10)	38 (10)	10 (6)	6 (5)
Motors	2	10	10	6	7 (1)	5 (1)	4 (2)
G.S.E.	0	10	10	3 (1)	2 (1)	2 (1)	2 (2)
Supporting Services	0	10	20 (4)	10 (2)	3 (2)	4 (2)	0
Production							
Hardware				6 (1)	30 (10)	38 (19)	49 (22)
Supporting Services				10	20 (3)	30 (9)	30 (4)
Operational Support							
Maintenance and G.S.E.							5 (3)
Systems Engineering							5 (4)
Product Improvement							5 (4)
TOTAL	6	100	110	85	100	89	106
Assigned to Scout Project Office			(11)	(14)	(27)	(38)	(46)

Also 3 personnel from the Scout Project Office are assigned to the San Marco Project. (FY 1964)

2. FACILITIES:

Existing in-house and contractor facilities used for the Scout project are listed in table XIV.

3. GROUND SUPPORT INSTRUMENTATION AND RANGE:

(a) The Navy is responsible for the PMR site. Figure 33 shows the PMR facility. The National Aeronautics and Space Administration has total responsibility at the Wallops site which is shown in figure 34.

(b) Payload instrumentation is not the responsibility of the Scout program.

4. FUNDS:

(a) Estimated funds required are listed in table XV.

(b) The $25,477,000 of development funds were expended as follows:

Langley Research Center	
Program ST-1-4	$ 8,550,000
Program ST-5-9	8,170,000
Wallops Complex	1,142,000
PMR Complex	1,100,000
Launch Services	1,888,000
Motor & Vehicle Improvements	2,200,000
O.S.S.	
Third & Fourth Stage Motor Development	2,250,000
PMR Complex Improvements	177,000
TOTAL	$25,477,000

(c) The production funds based on $1 million for each Scout vehicle were assigned as per table XVI.

(d) The operational support funds are being used for maintenance, ground support equipment, improvement of production hardware and techniques, necessary tests, environmental studies, supporting engineering requirements, standardization, central control, special data analysis, and miscellaneous requirements. These necessary expenditures will average about $4 million a year.

TABLE XIV - FACILITIES

1. Launch Complex

   (a) Wallops Station

   Launcher #1 (tower)(Figure 32)
   Launcher #2 & Shelter (Figure 32)
   Transporters
   Ground Checkout Equipment
   Spin Facility (range)
   Assembly Buildings (range)
   Motor Storage Facilities (range)
   Motor Handling Equipment
   Closed Circuit Television
   H_2O_2 Facility
   Heating-Cooling Facility
   Blockhouse (range)
   Launch Consoles (two sets) (Figure 35)
   Interplant Cabling
   Spares Stock Room

   (b) PMR

   Launcher and Shelter (Figure 36)
   Spin Facility (Figure 37)
   Transporter (Figure 38)
   Ground Checkout Equipment
   Range Users Building (Figure 39)
   Receiving Facility (checkout sets)
   Missile Assembly Building (test sets-Figure 40)
   Ordinance Assembly Building (test sets)
   Spares Stock Room
   Operational Support Building (test sets)
   Motor Storage (range)
   Interplant Cabling
   H_2O_2 Facility
   Heating (Air Force)

2. Storage Sites

   Hawthorne Nevada-Motor Storage

3. Langley Research Center

   Research Facilities
   Test Facilities

4. Contractors' Plants

   (a) Chance Vought Corporation

   Test Checkout Equipment ($2\frac{1}{2}$ sets)
   Twin Assembly Lines
   Jigs
   Spares Stock Room
   Minneapolis Honeywell Facilities

   (b) Aerojet General Corporation

   Manufacturing Facilities
   Test Stand Facilities

   (c) Allegheny Ballistics Laboratory

   Manufacturing Facilities
   Test Stand Facilities

   (d) Thiokol Chemical Corporation

   Manufacturing Facilities
   Test Stand Facilities

5. A.E.D.C.

   Tullahoma Test Facilities Available

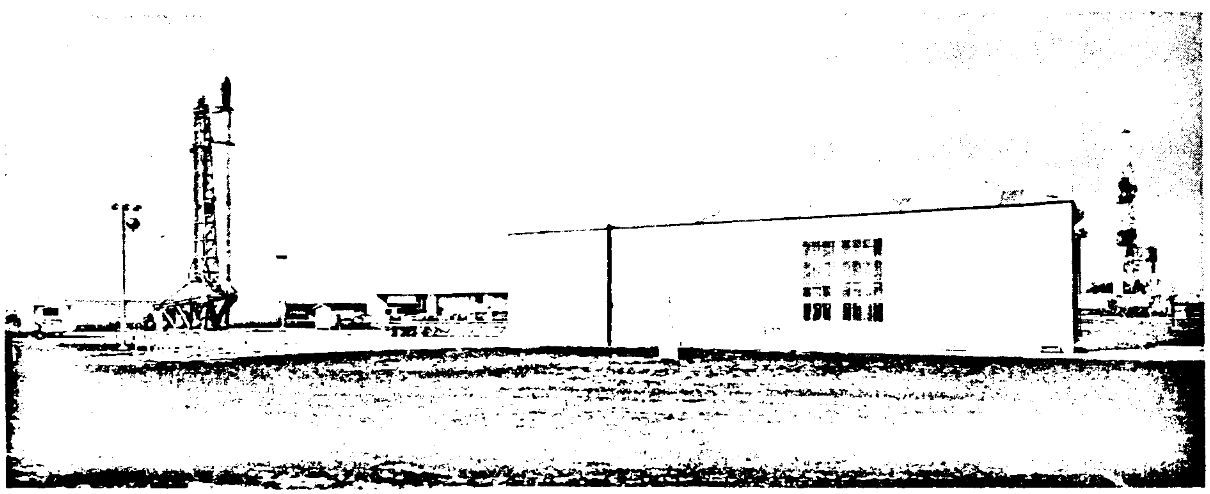


Figure 32.- Wallops Scout Launch Complexes.

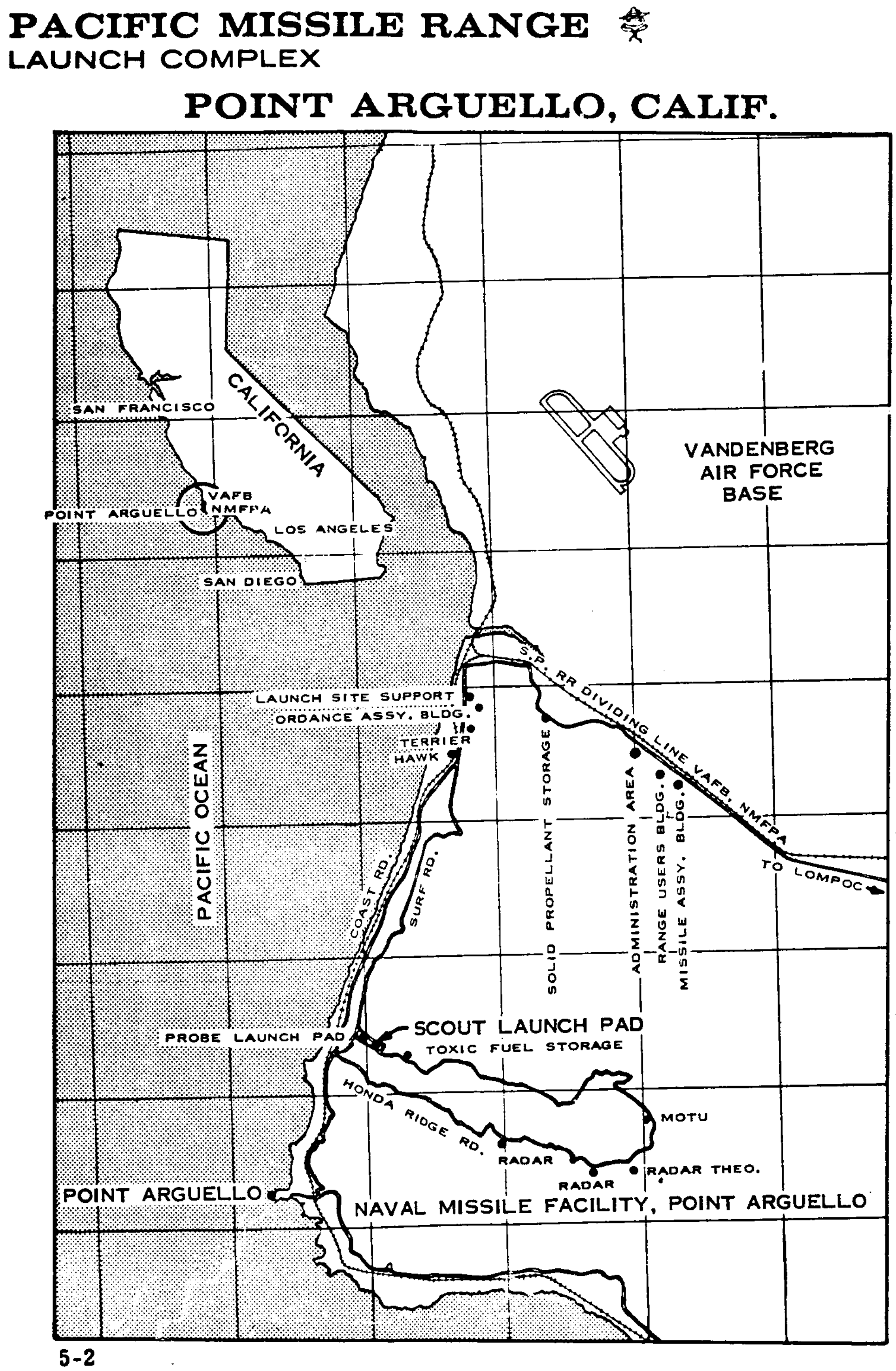
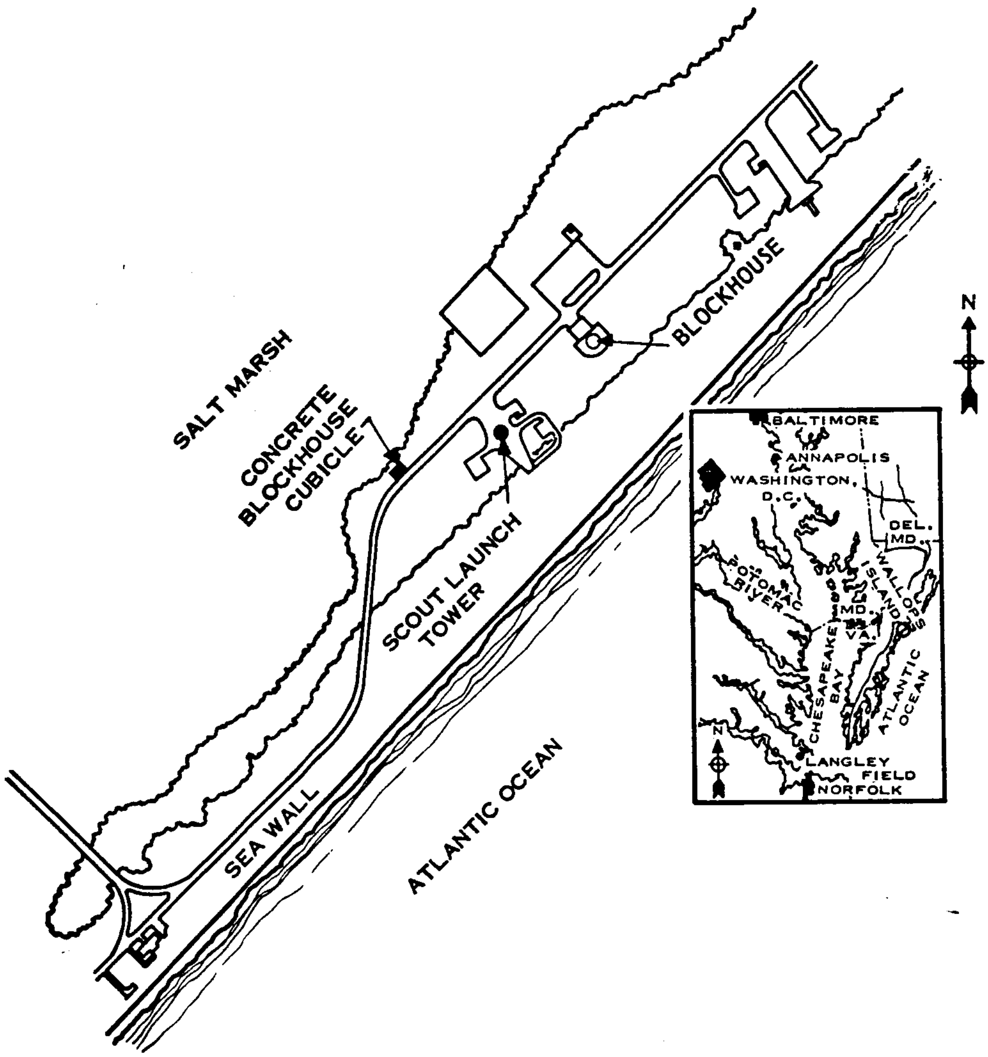


Figure 33.- Sketch of PMR launch site.

f 3

WALLOPS ISLAND
LAUNCH COMPLEX

WALLOPS ISLAND, VA.



5-3

Figure 34.- Sketch of Wallops Island launch site.

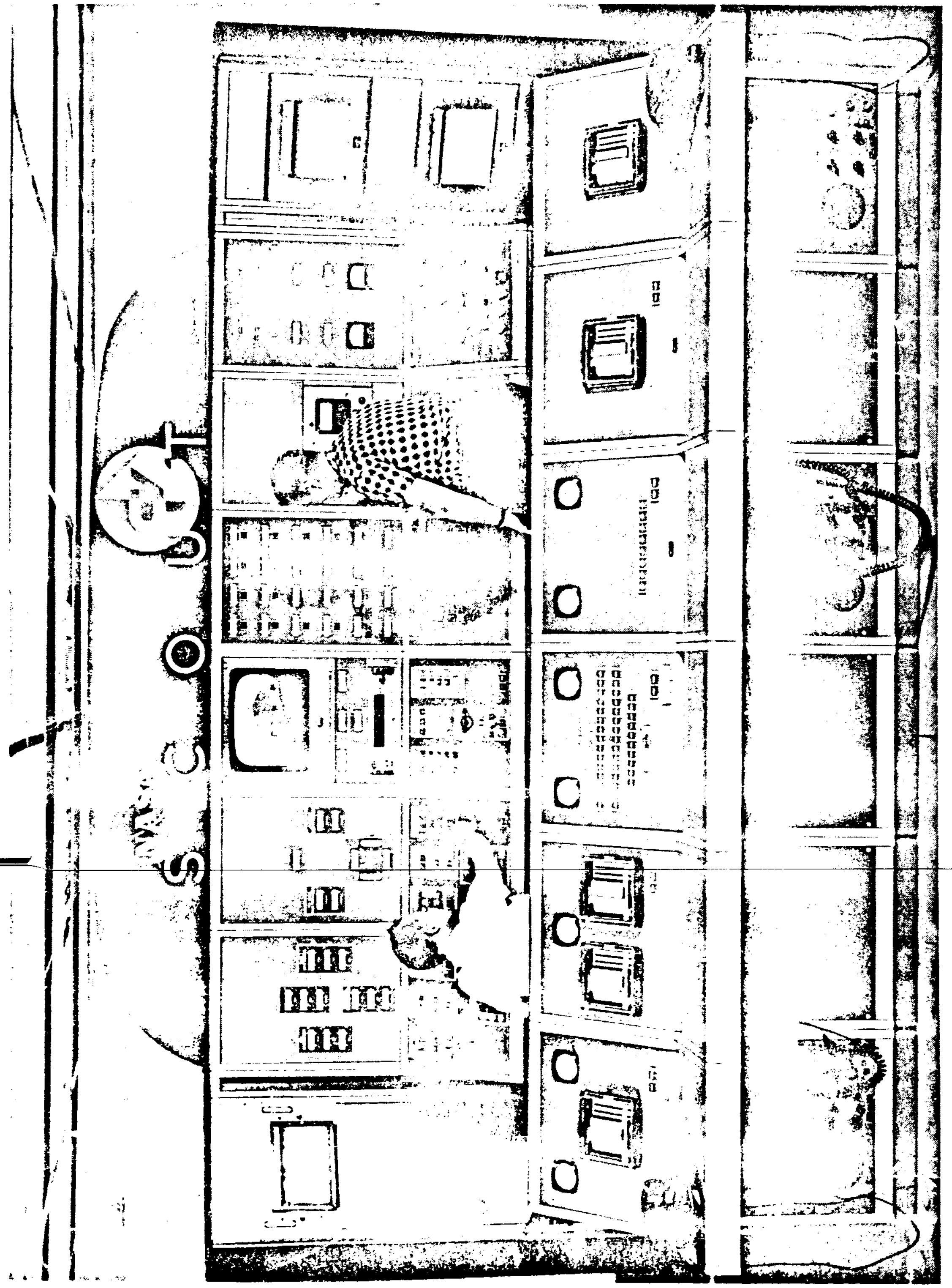


Figure 35.- Wallops launch complex blockhouse consoles.

P5

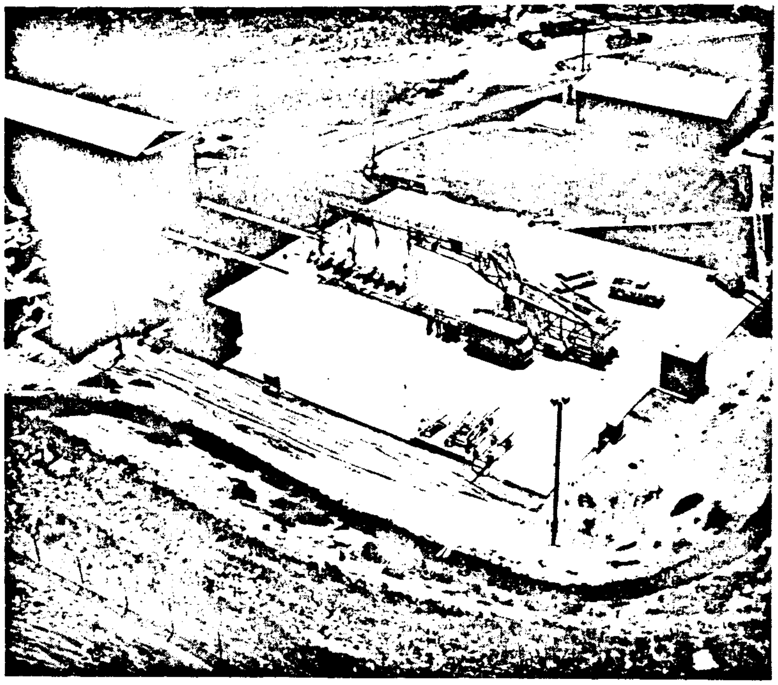


Figure 36.- Launch complex at PMR.

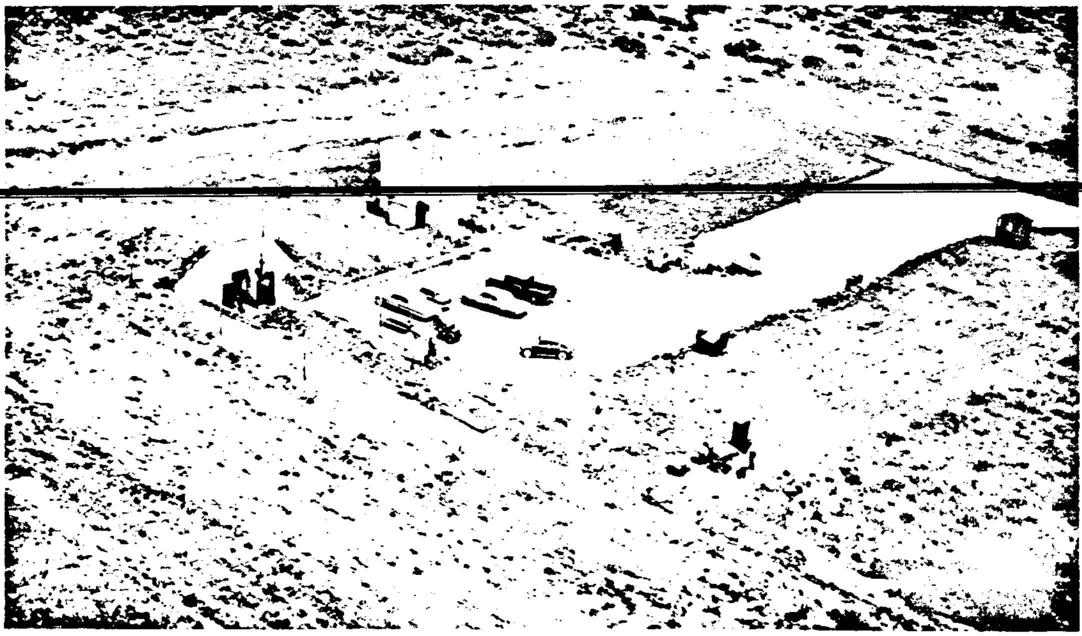


Figure 37.- Spin test building.

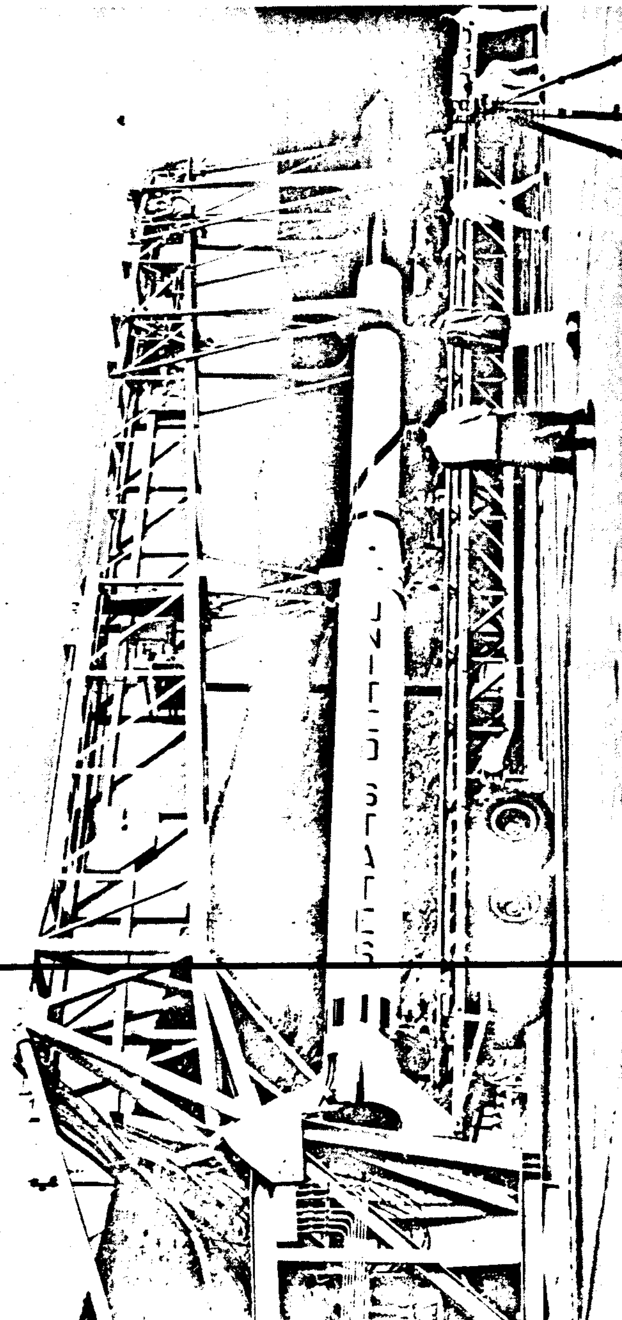


Figure 38.- PMR launcher and transporter.

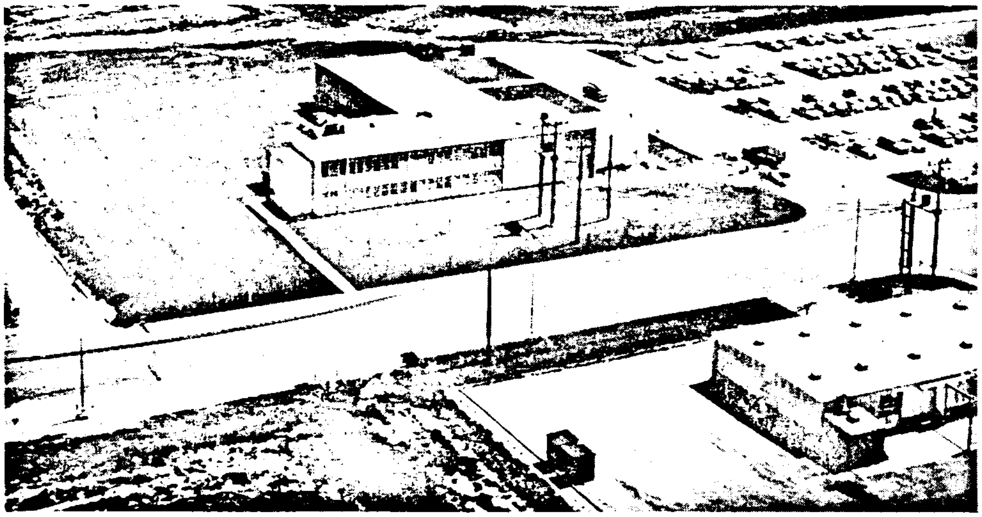


Figure 39.- Range users building.

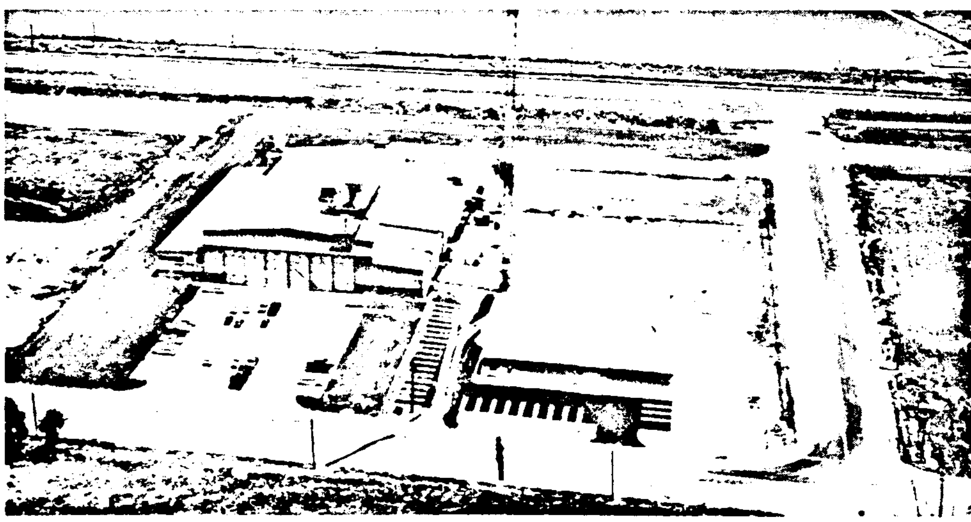


Figure 40.- Missile assembly building.

TABLE XV - FUNDS, Millions of Dollars (Fiscal Year Programs)

	FY 59	FY 60	FY 61	FY 62	FY 63	FY 64
Development						
Vehicle	2.651	1.419	5.663	.696	.993	
Motor	3.939	.904	.300*	2.642*	1.626	
GSE	.387	.077	.187	1.024	.904	
Supporting Services	.200	.600	.750	.338	.177*	
TOTAL DEVELOPMENT	7.177	3.000	6.900**	4.700	3.700	
Production (25 vehicles)				8 Veh.	9 Veh.	8 Veh.
Vehicle				5.230	5.500	4.600
Motor				2.095	2.025	2.000
Payload Mods				.250	.135	.120
Spares and Logistics				.395	.540	.480
Field Services				.230	.800	.800
TOTAL PRODUCTION				8.200	9.000	8.000
Operational Support						
GSE						1.000
Systems Engr.						1.100
Product Improvement						1.300
TOTAL OPERATIONAL SUPPORT						3.400
Construction of Facilities						
Wallops Complex					1.524	
Reimbursables (32 vehicles)			G.S.E.	18 Veh.	10 Veh.	4 Veh.
DOD			2.250	18.172	5.953	
AEC					3.234	4.000
TOTAL REIMBURSABLES			2.250	18.172	9.187	4.000
GRAND TOTAL	7.177	3.000	9.150	31.072	21.887	15.400

*Includes direct OSS contracts.
**Includes prototype Scout (No. 9).

TABLE XVI - NASA-SCOUT PRODUCTION VEHICLES

	FY Funds				
	61	62	63	64	65*
G & A					
S52-UK2			2		
-UK3					1
Italy San Marco			3	1	
Air Density/Injun Explorer				2	
France				2	
Ionosphere Explorers-S48		1		1	
International					2
Polar Ionosphere-S66		1	1		
University Explorers				0	2
OART					
Reentry		3	1	2	1
Micrometeoroid-S55		1	2		
SERT-I		2			
SERT-II					
OSS					
Prototype	1				
NASA TOTAL	1	8	9	8	6
REIMBURSABLES					
Navy-T		6	3		
Navy-S		2			
AEC			3	4*	
Air Force		10	4		
Others**		4			
TOTAL SCOUTS	1	30	19	12	6

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*Estimate.
**Not NASA procured.

(e) The $1,524,000 of C of F funds was obligated for the construction of a Mark II launch complex at Wallops Station which was completed in November of 1963.

(f) The DOD reimbursable funds to date are for Scout program requirements covered by the following MIPR's:

1) FY61 Program (GSE)

R61-7154 Part I	$ 1,500,000
62-6 Line 5	750,000

2) FY62 Program (18 Vehicles)

62-6 Line 1d	46,044
62-6 Line 2	1,864,670
62-6 Line 3a	7,245,636
62-6 Line 6c	240,000
62-6 Line 6d	50,000
62-6 Line 7	11,000
62-6 Line 8	50,000
R62-7086	975,000
R62-7097	4,500,000
R63-7098	2,325,000*
R61-7154 Part 2	300,000
R61-7195	100,000
63-29-AMD-1	464,000

3) FY63 Program (7 Vehicles)

63-29	2,565,000
63-32	3,388,000
TOTAL	$ 26,374,350

*One of these Scout vehicles was transferred to the AEC by the Navy.

(g) The AEC has funded $1 million dollars (from R63-7098 funds) DOD for one Navy Scout vehicle, which was launched at Wallops Station and $3 million to NASA for three additional Scout vehicles as noted in table XVI. The sum of $234,000 was also funded for launch services and miscellaneous requirements.

(h) NASA program allotments have been funded with the fiscal year funds as noted (through 12-1-63):

		(Thousands)
FY 1961		1,200
FY 1962		6,550
FY 1963		8,054
FY 1964		8,600
	TOTAL	24,404

(i) Table XVII shows complete Scout program obligations for the Langley Research Center. All fiscal year allotments are itemized and show the fiscal year in which these funds were obligated.

5. TRANSPORTATION:

(a) Commercial transportation is adequate, although special temperature control transtainers for motors are used. First stage Algols have custom trailers.

(b) Average transportation charges per vehicle are about $5,000.

TABLE XVII - SCOUT R AND D EXPENDITURES

FISCAL YEAR FUNDS	FISCAL YEAR OBLIGATED							
	FY 1959	FY 1960	FY 1961	FY 1962	FY 1963	FY 1964* (*Estimated)	FY 1965*	TOTAL
DEVELOPMENT								
FY 1959 S	$3,803,412.87	$ 7,075.13						$3,810,488.00
FY 1959	1,537,218.77	571,366.31	1,242,867.08	14,547.84				3,366,000.00
FY 1960		2,351,886.08	487,141.53	160,972.39				3,000,000.00
FY 1961			6,042,328.35	557,671.65				6,600,000.00
FY 1962				1,929,952.78	1,044,754.34			2,974,707.12
FY 1963					3,273,412.99	24,587.01		3,298,000.00
PRODUCTION								
FY 1961			884,841.00	315,159.00				1,200,000.00
FY 1962				5,969,094.53	562,145.55	17,854.45		6,549,094.53
FY 1963					7,131,507.85	921,992.15		8,053,500.00
FY 1964						4,600,000.00	4,000,000.00	8,600,000.00
OPERATIONAL SUPPORT								
FY 1964						3,400,000.00		3,400,000.00
SAN MARCO								
FY 1963					1,871,707.55	112,492.45		1,984,200.00
FY 1964						500,000.00	500,000.00	1,000,000.00
FY 1964 Trust Fund						136,046.00	63,954.00	200,000.00
DELTA MOTORS								
FY 1964						300,000.00		300,000.00
CONSTRUCTION OF FACILITIES								
FY 1963					1,230,037.56	293,962.44		1,524,000.00
AIR FORCE								
FY 1960		4,941,038.79	692,589.40	11,258.47	2,099.95			5,646,986.61
FY 1961			1,078,119.56	31,168.49				1,109,288.05
FY 1962				7,577,905.33	2,698,416.00	331,528.67		10,607,850.00
FY 1963					3,850,217.66	3,614,569.34		7,464,787.00
FY 1964						484,000.00		484,000.00
NAVY								
FY 1961			1,778,003.42		21,996.58			1,800,000.00
FY 1962				6,924,092.60	806,936.27	168,971.13		7,900,000.00
AEC								
FY 1963					1,183,018.60	1,961,181.40		3,144,200.00
SUBALLOTMENTS-RECEIVED								
FY 1961			43,800.00	11,606.82				55,406.82
FY 1962				39,558.00				39,558.00
FY 1963					8,000.00			8,000.00
TECHNOLOGY FUNDS								
FY 1962				504,412.00				504,412.00
TOTAL	$5,340,631.64	$7,871,366.31	$12,249,690.34	$24,047,399.90	$23,684,250.90	$16,867,185.04	$4,563,954.00	$94,624,478.13

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X. COORDINATED OPERATIONS PLAN

1. Agreements

   (a) NASA/DOD-PMR

   See appendix B

2. Vehicle Operations Plan

   A typical Vehicle Operation Plan is illustrated in appendix C.

   Figure 41 shows a Scout in launch position at PMR.

3. Payload Coordination Plan

   The Scout Payload Coordination Plan is outlined in table XVIII.

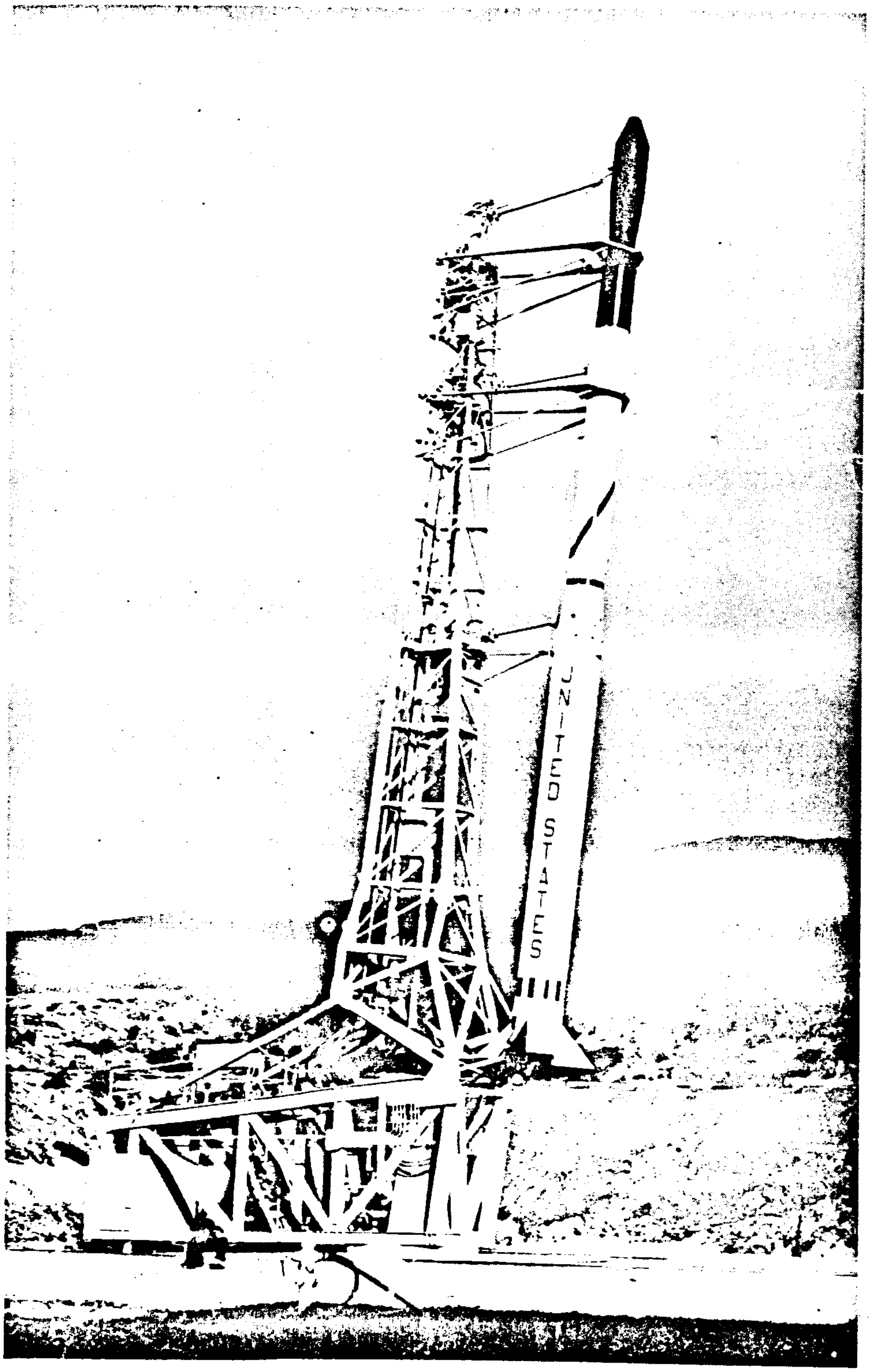

Figure 41.- PMR launcher being raised to launch position.

TABLE XVIII - SCOUT PROJECT PAYLOAD COORDINATION

Months	EVENTS
-18	1. Payload assigned to Scout 2. MWG formed 3. Launch site selected 4. Design data to payload agency 5. Payload design data to vehicle 6. Establish documentation req.
-12	MWG Review 1 1. Establish approx. launch date 2. Determine performance and accuracy req. 3. Prelim. heat shield design 4. Payload tracking coverage 5. Define spin limits 6. Review range documentation req.
-9	MWG Review 2 1. Establish launch date 2. Define boost trajectory constraint 3. Define prelim. payload mission requirements
-7	1. Define final design of payload system and heat shield 2. Define wiring required for payload flyaway umbilical cable
-6	MWG Review 3 1. System design integration complete 2. Submit range documentation 3. Define heat shield eject. test req. and date for test 4. Provide 3 D.O.F. trajectory to payload agency
-5	Payload config. and mission defined to permit contractor to proceed with range safety report

Days	EVENTS
-90	MWG Review 4 1. Final date for start of range safety study 2. Definition of vehicle motor performance 3. Spin motor req. final 4. Establish final date for payload 5. Review and establish firm launch date
-60	1. Heat shield ejection test at Dallas 2. R.F.I. check at Dallas 3. Range safety study to PMR
-30	1. Payload arrives at launch site 2. Final trajectory due at launch site 3. Configure launch complex for payload
-15	1. Pre-pad checks 2. Payload and vehicle simulated flight and R.F.I. checks
-10	1. Spin balance payload and vehicle fourth stage together 2. Physical measurements
-9	Final Preassembly checks
-4	1. Mate payload with vehicle at pad 2. Vehicle and payload RFI check at pad
0	LAUNCH OPERATION

XI. PROJECT RESULTS

1. Project Results

The vehicle prime contractor (Chance Vought Corporation) is under contract with LRC to publish the flight results for all NASA vehicles. The payload data and associated systems are the responsibility of the Payload Agency.

The Project Manager will recommend for NASA publication any appropriate technical accomplishments and results.

The up-to-date success ratio is shown in figure 42.

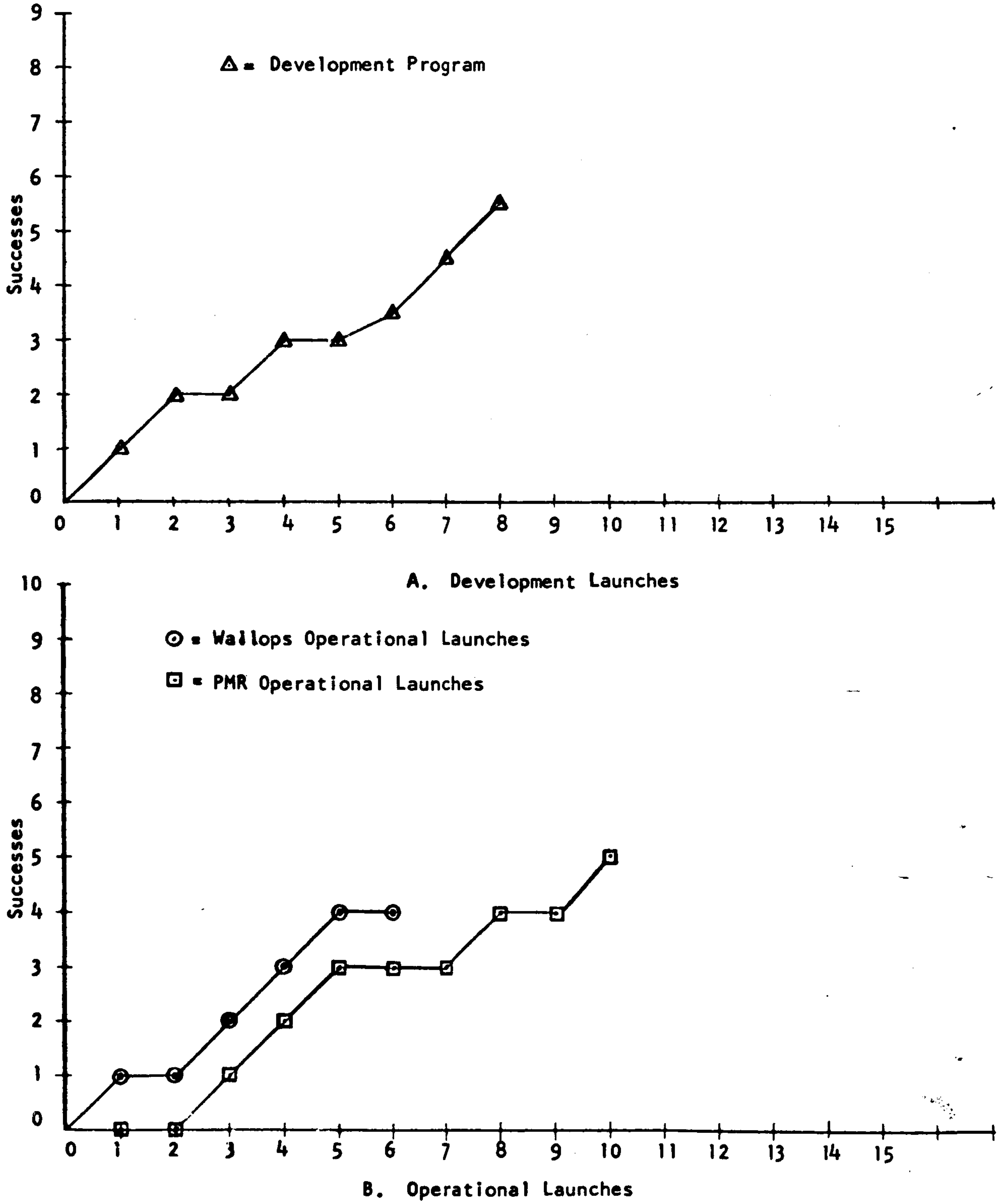

Figure 42.- Scout success ratio.

APPENDIXES

A. NASA/DOD Scout System Organizational Agreement

B. Joint Operating Agreement NASA/DOD Scout

C. Vehicle Operation Plan

APPENDIX A

NASA/DOD SCOUT SYSTEM ORGANIZATIONAL AGREEMENT

Concur ____________________

Donald H. Heaton
Colonel, USAF
Director of Vehicles
NASA Headquarters

Concur ____________________

Henry H. Eichel
Colonel, USAF
Deputy for Launch Vehicles
Space Systems Division

Approved ____________________

for Dr. Homer E. Newell
Director, Office of
Space Sciences
NASA Headquarters

Approved ____________________

for O. J. Ritland
Major General, USAF
Deputy to the Commander, AFSC
Manned Space Flight

NASA/DOD SCOUT SYSTEM ORGANIZATIONAL AGREEMENT

Objectives

Development, procurement and operation of a standard Scout vehicle system which is capable of reliably, economically and expeditously fulfilling approved mission requirements is the primary objective of the Scout Vehicle System Organization.

To obtain this broad objective, a series of committee studies "white paper", and individual management agreements have been definitized in the past. All of the considerations to date have been designed to fulfill previously established policy which was re-enunciated on 24 August 1961 by Mr. Webb and Mr. Gilpatrick for both NASA and DOD that, "Joint programs under a single management prevents duplication and promotes efficiency".

This agreement is designed to promulgate to all interested parties the relationships, responsibility assignments and delegations of authority which have been instituted to fulfull the overall NASA/DOD Scout vehicle system requirements. In addition, it provides the basis for future revision so that the Scout organization can serve the widest variety of users within its basic capability.

Introduction

In consonance with the established policies, the Scout vehicle system organization comprised of both Department of Defense and NASA offices has been functioning since the Summer of 1961 with the exception of the organizations located at the launch ranges. Joint Operating Agreements for NASA/DOD Launch Operations will be obtained for each range as necessary. These agreements shall be in accordance with the overall system organization established herein.

Definition of the Scout vehicle system includes the following:

a. Vehicle, including motors and heat shields.
b. Launchers.
c. Vehicle test equipment.

d. Test and checkout procedures.
e. Vehicle range documentation.
f. Final integrated operation countdown manual.
g. Vehicle data reduction.
h. Change control over all system items.
i. Vehicle and Aerospace ground equipment spares.
j. Spin test facility.
k. Launch personnel.

Standardization of the delivered hardware is only part of the effort required to maintain a standard vehicle system which is capable of meeting a wide variety of mission requirements. The checkout and launch procedures must also be standardized. This requires that the test equipment used at the various launch sites be at least functionally identical. If the test equipment is identical and similar coordinated procedures are utilized at all launch sites, then the experience obtained from each field location are directly applicable to the other field location and within the manufacturer's plant. If different procedures or equipment are used at one site, experience gained cannot necessarily be applied for improved effectiveness at the others.

An important step in building an organization capable of effective system operation has been taken by the NASA and DOD in the establishment of an integrated program logistics plan. Under the single management of the Langley Research Center, a contractor operated logistics support plan is functioning. This total plan will assure that proper spares/logistics support is available to all operational sites as required. Of possibly greater importance, the plan establishes a direct communication link with the contractor's home plant and assures that each field failure is properly reported. The Langley Project Group can monitor the failure analysis techniques used by the contractor and initiate actions within the plant which will correct the field discrepancies. Past experience has indicated that a system like this is one of the best possible means to maintain operational reliability at various locations over an extended time period.

To be consistent with the reliability and standardization objectives which have been incorporated within the Scout program, it is also necessary that strict configuration control over the launch facility be maintained. Otherwise, the unique individual requirements of different launch crews will evolve different launch techniques and modes of operation. As these evolve, the vehicle, to be compatible with the different operations, will become tailored to fit a particular launch facility and method of operation. When this has happened, then there will be separate production lines being operated in support of each launch facility. The economies in production and higher reliabilities associated with standard vehicle hardware are then lost.

The organization is designed to maximize procurement economies, assure the highest reliability via strict configuration control of all system items and provide flexibility to meet the variety of mission requirements now assigned to the Scout system. Responsibility assignments have been matched with proper delegations of authority so that each office and organization associated with the total Scout system organization can perform its assigned functions in an efficient, economical and timely manner.

NASA/DOD Coordinating Committee

This Committee is composed of memvers representing NASA Headquarters, NASA Langley Research Center, Air Force Systems Command and the Air Force Space Systems Division. The Committee is established as the result of a memorandum of understanding signed by Dr. Hugh Dryden and General White in 1958. Specific Committee functions include the following:

a. Master system scheduling. This includes establishment and maintenance of a stable production rate in all associated contractor facilities and development of launch schedules which are consistent with a stable production rate, the pad loading capability of the operating Scout launch sites and relative mission priorities.

b. It provides tight control of the Scout system configuration by the joint efforts of all participating organizations to obtain maximum reliability, procurement economies and optimum flexibility in meeting total NASA/DOD mission objectives for the Scout system.

c. Broad conceputal configuration control is exercised by the Committee. To accomplish this function the Committee reviews mission requirements to determine Scout suitability for the proposed mission. Requirements that demand excessive vehicle modification or deviation from the standardized vehicle concept are returned to the respective organizations for reconsideration. Every reasonable effort will be exerted to negotiate an appropriate compromise so that the mission objectives may be accomplished. When these efforts are unsuccessful, the mission requirement will be referred to other suitable authority for consideration of other alternatives.

d. The Committee establishes the basis for funding agreements between the DOD and NASA for both procurement of operational hardware and the development or modification of new or existing system items.

Air Force Systems Command Headquarters

This organization provides representation to the NASA/DOD Scout Coordinating Committee and provides general DOD requirements, program direction and forecasts for the Scout system.

NASA Headquarters

NASA, as the lead agency responsible for the Scout system, provides a Scout Program Office in Headquarters. This office servies as a focal point for all Scout system items. The Scout Program Manager is the Chairman of the NASA/DOD Scout Coordinating Committee.

The program office compiles the NASA payload requirements from the Goddard Space Flight Center, the Langley Research Center, the Lewis Research Center, other NASA payload agencies and those presented by AFSSD. These requirements are compiled into a total program requirement and proper funding obtained for procurement of the operational vehicles.

Funding is also obtained for development of new equipment to fulfill the requirements established and agreed to by the NASA/DOD Scout Coordinating Committee. These total requirements for both development and procurement are then translated into program direction to the responsible NASA field center (Langley Research Center).

Funding for DOD requirements, both procurement and development is obtained from the Space Systems Division. Direct contact between these two organizations establishes both budgetary estimates and delivery order pricing.

NASA Langley Research Center, Scout Project Group

The Scout Project Group at the Langley Research Center translates the program requirements established by Headquarters into the technical direction and contractor management necessary to fulfill the assigned vehicle system requirements. This includes detailed technical direction of all associated vehicle contractors, the preparation of financial operating plans to assure that all committed delivery schedules can be met within the established funding limitations, the preparation of and certification of operational checkout, test and countdown procedures, the preparation and certification of the test procedures utilized within the contractor's facilities to assure that quality hardware consistent with the program requirements is delivered, the detailed system scheduling necessary to meet the Master Schedule requirements established within the Scout Coordinating Committee, proper contractual actions with all contractors in a timely and economical manner, the provision of program logistics and spares to assure successful operation of operating launch sites and Scout system equipment as well as the basic vehicle. The provide the detailed configuration and change control of Scout system items within the conceptual basis established by the NASA/DOD Scout Coordinating Committee.

In carrying out this function assignment, the Scout Project Group deals directly with Space Systems Division Directorate of Standard Launch Vehicle I providing technical reports, vehicle documentation, detailed schedule information, general payload coordination and resolving the detailed technical requirements associated with the day-to-day operation of a total system. This organization also maintains a system failure analysis record, monitors the contractor's efforts and takes corrective actions as necessary. Vehicle flight test data from the launch sites is obtained and the final vehicle flight test report is validated after proper data reduction.

Space Systems Division (SSD)

Within the Space Systems Division the Directorate of Standard Launch Vehicle I (SSVB) has been assigned as the organization which compiles the DOD mission requirements from both current and potential Scout users, ascertains relative priorities of these DOD requirements and exercises direct management control through the established Scout system organization for all Scout vehicle support of the DOD missions. SSVB is also responsible for officially defining DOD requirements to the NASA/DOD Scout Coordinating Committee, NASA Headquarters and the Langley Scout Project Office as appropriate. SSVB coordinates overall DOD mission schedules to assure proper time phase relationships of all the elements necessary for accomplishment of specific program launch objectives in accordance with the master schedules established by the NASA/DOD Scout Coordinating Committee.

They are responsible for providing proper funding to NASA Headquarters to meet the DOD development and procurement schedule objectives established on the Master Scout System Schedule. SSVB also coordinates, collects and assures timely submission of vehicle documentation and procedures for the West Coast operation via the NASA/DOD Scout PMR office. This documentation may be obtained from special contractor support or from the Scout Project Group at the Langley Research Center depending upon which source seems most likely capable of fulfilling the immediate requirements. Due to the close working relationship between the Scout Project Group at Langley and the Scout Project Office within SSD, it is not expected that any duplication of basic documentation will be experienced.

6595th Aerospace Test Wing

The 6595th Aerospace Test Wing has been assigned the responsibility for launch operation and maintenance of the Scout vehicle system at the Pacific Missile Range. Consequently, all vehicle hardware is delivered to this organization for acceptance, checkout, assembly, countdown and launch. Program spares for all vehicle system equipment are provided via the logistic system established and operated by the Scout Project Group at Langley and the Contractor. Authority is granted to the 6595th to draw any and all program support spares required to accomplish the established schedule in accordance with the logistic operating plan.

The Test Wing performs all functions of the launch crew, provides flight contol officers and deals directly with the PMR to obtain proper schedules and support necessary in fulfillment of their vehicle operational responsibility. The assignment to the 6595th of these particular functions is documented in more detail in both the PMR operational working agreement attached hereto and the minutes of the Scout PMR planning conference of 15 August 1961.

The 6595th provides representation to the Joint NASA/DOD Scout PMR Office to assure that all documentation for the vehicle is consistent with operational philosophy, approved procedures and existing schedules as previously established.

Joint NASA/DOD Scout PMR Office

This office is comprised of designated representatives of the 6595th Aerospace Test Wing and the Assistant Director of the NASA

Pacific Launch Operations Office for Langley Research Center operations. This individual reports directly to the Head of Scout Project Group at Langley on all technical, administrative and operational control matters. The primary function of this office is to assure that all vehicle documentation is submitted to the PMR in accordance with the existing time, format and content requirements and accurately depicts the currect Scout vehicle system configuration. This office provides a central contact point for PMR and is authorized to be the direct negotiating agent for both SSD and the Langley Research Center to the PMR for all Scout vehicle problems. It is also assigned the responsibility to obtain from either SSD or the Scout Project Group at Langley, as appropriate, the accurate, current information required to satisfy a direct participant to assist both DOD and NASA mission (program) directors in their dealings with PMR as requested.

Mission or Program Directors

The director is the individual responsible for any specific overall mission or group of missions. His parent organization may be either NASA or DOD, depending upon the mission. He may be the director of a major system program using Scout or the manager of a single payload. In any event, he has direct access to his parent organization, direct access to the launch ranges, as necessary, as well as direct access to the respective joint NASA/DOD Scout offices and any other organization as necessary to assure fulfillment of his assigned mission responsibilities. He shall provide to the NASA/DOD Scout PMR office all criteria necessary for successful mission attainment sufficiently in advance that the Scout office can assure that all necessary submissions, preparations and approvals for the vehicle with the range have been accomplished. He shall participate in preparing the final integrated countdown.

The total relationship between DOD, NASA, assigned mission director and the launch ranges is covered in more detail in the applicable range operating agreements for Scout.

NASA/DOD Scout Wallops Island Project Office

This office is a duplicate of the PMR office and is established to perform the same function at Wallops Island. The establishment of these two offices provides common focal points and points of entry for all Scout business with the respective ranges. User requirements, documentation, procedures, etc., are channeled through these offices for purposes of compliance with range requirements, format and schedules.

6555th Aerospace Test Wing

This organization performs the equivalent functions of the 6595th Aerospace Test Wing as launch agency in accordance with a NASA/DOD Scout AMR Operating Agreement to be written later.

Wallops Operations-Langley/Chance Vought

This organization performs a similar function to that of the 6595th Aerospace Test Wing at the Wallops Station Range. The primary difference is that this organization is managed by the Scout Project Office at Langley and utilizes a Chance Vought launch crew. Their functions and maintenance are essentially identical. A close working relationship has been established between the 6595th and the Wallops operation crew. This relationship is expected to continue. The sharing of mutual difficulties and obtaining satisfactory, remedial action via the Scout Project Group at Langley will tend to assure reliable operation of the vehicle at both launch sites.

Prime Vehicle Contractor - Chance Vought

The Chance Vought Corporation, wholly owned subsidary of the Ling-Temco-Vought Corporation, was established by NASA in the Fall of 1960 as the prime vehicle contractor for the Scout system. Their responsibility includes vehicle design, development and manufacture of all system related items, excluding the government furnished motors. The contractor maintains and operates under direction of the Langley Scout Project Group a program spares and logistics system which is designed to fulfill all vehicle peculiar requirements in this area to the operating ranges. They prepare and submit for Langley approval the detailed pre-flight test plans for each mission, maintain a competent failure reporting and reliability system and perform final data reduction to prepare post flight reports on all Scout vehicle flights.

APPENDIX B

JOINT OPERATING AGREEMENT NASA/DOD SCOUT
LAUNCH OPERATIONS AT
PMR

Concur ______________ Concur ______________

Donald H. Heaton
Colonel, USAF
Director of Vehicles
NASA Headquarters

Henry H. Eichel
Colonel, USAF
Deputy for Launch Vehicles
Space Systems Division

Concur ______________

Joseph Cody
Colonel, USAF
Commander
6595th Aerospace Test Wing

Approved ______________

for Dr. Homer E. Newell
Director, Office of
Space Sciences
NASA Headquarters

Approved ______________

for O. J. Ritland
Major General, USAF
Deputy to the Commander, AFSC
Manned Space Flight

Joint Operating Agreement NASA/DOD Scout Launch Operation at PMR

1.0 Scope. This agreement establishes a method of operation for the NASA/DOD Scout vehicle system and launch facility at the Pacific Missile Range, Pt. Arguello, California. It provides the necessary detailed guidelines for implementing the basic policy agreements previously reached between NASA and the Department of Defense.

2.0 Scout Launch Facility.

2.1 The NASA/DOD Scout launch facility at PMR consists of the Scout pad, launcher, shelter, transporters, handling equipment, blockhouse console equipment, interconnecting cabling, the test equipment in the missile assembly building area and the ordnance assembly building, and the Scout spin test facility.

2.2 The responsibility for design, procurement, installation and implementation of detailed configuration change control of the Scout/PMR launch facility has been assigned to the NASA Langley Research Center. This responsibility includes technical direction of the design and installation, accountability of the equipment items procured by NASA contracts, configuration control of all equipment peculiar to the Scout vehicle system, maintenance support of this vehicle system equipment and logistic support, including procurement of spares and necessary field modification kits.

2.2.1 The authority to fulfill the responsibilities enumerated above has been delegated to the Scout Project Group at the NASA Langley Research Center.

2.2.2 The responsibility for operation and maintenance of the Scout/PMR launch facility has been assigned to the 6595th Aerospace Test Wing. This responsibility includes maintenance of standard operating procedures which are consistent with the delivered vehicle hardware, the launch site equipment, the general procedures utilized at Wallops Island and custody of all Scout launch complex equipment. In addition, their responsibility includes scheduling, evaluation of all launch site equipment and vehicle hardware, initiation of recommendations for configuration changes, the provision of skilled personnel necessary for operation and maintenance of the launch site, the conduct of all Scout vehicle operations including preparation and submission of the integrated countdown manual.

2.2.2.1 The 6595th Aerospace Test Wing is also responsible for the launch equipment peculiar to the Scout vehicle system. This includes routine trouble shooting and equipment repair. Authority is delegated to the 6595th to make all minor on-site modifications which do not affect the fit, function or reliability of the vehicle system. Maintenance of drawings and records to detail the current configuration and status is also an assigned responsibility.

2.2.2.2 The authority for originating minor on-site modifications does not extend to any major modification which involves a change in the fit, form or function of either the vehicle or launch site equipment without the written concurrence of the Langley Research Center Scout Project Group.

2.3 Joint NASA/DOD Scout PMR Office. This office is comprised of designated representatives of the 6595th Aerospace Test Wing and the Assistant Director of the NASA Pacific Launch Operations Office for Langley Research Center PMR operations. The Assistant PLOO for Langley reports directly to the Head of the Scout Project Group at Langley on all technical, administrative and operational control matters regarding the Scout vehicle.

2.3.1 The primary function of this office is to assure that all Scout vehicle documentation is submitted to the PMR in accordance with the time, format and content criteria established by PMR. In addition, this Office is responsible for assuring that all documentation submitted accurately depicts the current Scout vehicle system configuration. The office provides a central contact point for PMR and is authorized to be the direct negotiating agent for both SSD and the Langley Research Center to the PMR for all Scout vehicle problems. They may obtain from either SSD or the Scout Project Group at Langley, as appropriate, the information required to satisfy all PMR Scout vehicle documentation requirements. They also serve as a consultant or as a direct participant and assist both DOD and NASA mission (program) directors in their dealings with PMR as requested.

2.3.2 This office will provide to the responsible mission director an up-to-date compilation of all vehicle documentation which must be referenced along with the required mission peculiar information. This does not include the detailed flight trajectory or the basic vehicle Pre-Flight Planning Report.

3.0 Launch Operations.

3.1 A spacecraft mission or program director for each Scout vehicle launch will be assigned by either the NASA or DOD as appropriate. The director has overall mission responsibility and commensurate authority for mission decisions, spacecraft preparation and for furnishing to the Joint NASA/DOD PMR/Scout Office vehicle criteria necessary for successful mission accomplishment. He shall participate directly in the launch operations to assure mission readiness and make every reasonable effort to define in advance of the operation the minimum mandatory requirements for spacecraft operation. The spacecraft requirements and procedures will be suitably defined in the integrated countdown manual prepared by the 6595th and coordinated with the mission director. The director also has full authority to stop or hold the countdown wher the minimum requirements for completion of his mission objectives are not being met.

3.1.1 The 6595th Aerospace Test Wing has the authority for planning vehicle launch operations and conducting the integrated countdown. This authority will be exercised through the Chief Blue Scout Military Launch and Test Branch.

3.1.1.1 The 6595th Aerospace Test Wing will be the formal point of contact with the PMR for all Scout vehicle operational matters and for the DOD spacecraft information.

3.1.2 The Scout Project Group at the NASA Langley Research Center holds a technical override over all Transit, S-48 or SolRad launch operations and launch facility functions during initial PMR operation. This technical override is to remain in effect, in accordance with previous agreements, until the first successful Transit or S-48 launch has been accomplished. After this successful orbit, the specific NASA technical override will be terminated on all vehicles carrying DOD payloads. However, it is expected that continuing NASA technical support will be provided to the extent desired by the 6595th Aerospace Test Wing.

3.1.2.1 For all Scout vehicles carrying NASA payloads, the Scout Project Group, Langley Research Center, will continue to exercise a technical override authority over all aspects of the launch operation. This override ability is necessary for the project group to fulfill the responsibilities assigned to them within the present NASA organization.

3.1.2.2 A NASA test director will be assigned for all Scout launches through the first successful Transit or S-48 launch and thereafter for all NASA payloads. The NASA test director will be responsible for verifying that the vehicle preparations have been properly executed and for specifically concurring that the vehicle is launch ready. He will be delegated the authority to exercise the NASA technical override responsibility in the event such action is necessary. During the vehicle preparation, he has full authority to monitor, observe, review all test procedures and witness operations. During the actual countdown, he will be located at the blockhouse to serve as consultant to the Launch Control Officer.

3.2 Formal agreements regarding the final operational definition can be made only by the responsible groups defined in 3.1 and 3.2.2.

3.2.2 The Scout Flight Test Working Group (FTWG) is assigned responsibility for planning and coordinating all prelaunch and launch operations. This group will be chaired by the 6595th Aerospace Test Wing. The minutes will be signed by the Chairman and considered as official agreement upon his signature and where appropriate, the concurrence of the permanent NASA Scout member of the FTWG.

3.2.3 During the prelaunch and launch phases of the vehicle assembly test and checkout, representatives of the Scout Project Group, Langley Research Center, will observe the operations of the 6595th Aerospace Test Wing. This observation is intended as assistance to the 6595th and to provide technical familiarization to the Scout Project Group regarding the unique operating environment experienced at PMR. Technical discussions aimed at improving reliability, procedure and operational simplification will occur. However, no changes will be made without the concurrence of the responsible authority in the 6595th Aerospace Test Wing and the NASA test director.

3.3 Launch Organization

3.3.1 The 6595th Aerospace Test Wing Launch Control Officer has overall authority for conduct of the countdown, subject to the previously defined NASA technical override. He receives direct imputs from the NASA test director and the assigned spacecraft mission director as well as his own vehicle operating organization.

3.3.2 The blockhouse organizational details are defined below. All individuals noted are physically located at prescribed locations on the blockhouse consoles.

3.3.2.1 Launch Control Officer. Controls the overall countdown of the total vehicle, including spacecraft. He is responsible for launch complex readiness, operations and the readiness of the Scout vehicle configuration. An officer of the 6595th Aerospace Test Wing will act as the launch control officer for all Scout PMR launch operations.

3.3.2.2 The NASA test director monitors the countdown operation and verifies that launch preparations are satisfactory. In the event of any question during the vehicle preparation or countdown, he has full authority to speak for NASA regarding the readiness of the vehicle and will exercise, if necessary, the technical override authority previously defined.

3.3.2.3 The NASA or DOD spacecraft launch conductor performs the spacecraft countdown reporting to the launch control officer concerning readiness of the spacecraft. He also reports directly to the assigned spacecraft mission director concerning the spacecraft's status and condition.

3.3.3 Organizational duties of persons with launch operational responsibility but located outside the blockhouse.

3.3.3.1 The assigned NASA or DOD spacecraft mission director provides local direction of all mission activities at PMR. He colates imputs from tracking networks, communication facilities, spacecraft launch conductor and monitors the vehicle countdown status to determine total status of the world-wide tracking systems and maintains communication with the launch control officer during all launch preparations. The spacecraft mission director has full authority to hold or cancel the operation when in his judgment any factor effecting the success of his mission is below acceptable minimums. The exercise of this authority must be accomplished with a full realization of the time, cost and operational complexities associated not only with the spacecraft but the vehicle requirements. He must also recognize the continuing schedule commitments which have been placed on the Scout vehicle system.

3.4 Vehicle Test Reporting. Reports on the NASA/DOD Scout vehicle operations will be finally coordinated and signed by the representatives in the NASA/DOD Scout PMR Project Office. This is not intended to conflict with existing AFSC or NASA mission reporting requirements. In case of conflict, the organization responsible for the overall mission shall define any required procedures.

3.4.1 Raw data on Scout vehicle performance shall be collected by the NASA/DOD Scout Project Office for immediate transmission to the Scout Project Office, Langley Research Center, and the Chance Vought Corporation.

3.4.2 The final flight test report on Scout vehicle performance including any mecessary failure analyses shall be prepared and authenticated under the direction of the Scout Project Group, Langley Research Center. Gross vehicle failures which prevent mission accomplishment will be investigated under to the direction of the FTWG chairman. Distribution of this report will then be made to all interested and participating activities for concurrence and comment.

APPENDIX C

OPERATION PLAN

FOR

SCOUT S-127

NASA APPROVED:

J. D. Church
Langley Research Center
Head SPG Operations

J. C. Palmer, Chief
Flight Test Division
NASA Wallops Station, Virginia

SUBMITTED:

CHANCE VOUGHT CORPORATION
ASTRONAUTICS DIVISION

B. H. Kilgore
Supervisor
NASA Scout Flight Test

APPENDIX C

OPERATION PLAN FOR SCOUT S-127

INDEX

OPERATION PLAN FOR SCOUT S-127

1.0 GENERAL

The information contained herein, which is submitted in compliance with Appendix B of Reference (1), presents the operational data required in the conduct of the Scout Research Vehicle S-127 mission.

The mission will be conducted in accordance with References (2) and (3). In the event there is any inconsistency between the Operation Plan and References (2) and (3), the Operation Plan shall be the controlling factor.

All details of the payload operational requirements, description, etc., are presented in Reference (6). The payload information presented herein is that which affects vehicle operation and general information for a ready reference, such as telemetry, frequencies, power, etc.

1.1 OPERATIONAL INFORMATION

a) Launch Station:	Wallops Island, Virginia
b) Launch Site:	Launch Area #3, (Scout Pad) Lat. 37° 50' 57.2810" Long. 75° 28' 22.2005"
c) Launch Vehicle:	Scout S-127
d) Launch Time (T-Zero):	2200 EST
e) Launch Window:	2200 to 2330 EDT
f) Master Countdown: Starting Time	T-8.0 hours
g) Blockhouse Manning Time:	T-8.5 hours
h) RCC Manning Time:	T-2.5 hours
i) FEC Manning Time:	T-2.5 hours
j) Weather Limitations:	
Cloud Coverage:	5000' Minimum Ceiling, Broken Overcast
Surface Winds:	35 knots maximum
Precipitation:	None
Upper Winds:	The upper wind limits will be based on an .001 probability on the wind curves in Reference (3).
k) Mission Type:	Orbital
l) Mission Payload	International Satellite UK-2/S-52

1.2 BRIEFING AND CRITIQUE

A pre-mission briefing and a post dress rehearsal critique will be conducted. The briefing will include all personnel, while the critique will only involve the blockhouse operating personnel. All agencies will be notified concerning the briefing.

2.0 OBJECTIVES

2.1 VEHICLE OBJECTIVE

To provide the required boost for the UK-2/S-52 payload to place it in orbit.

2.2 PAYLOAD OBJECTIVES

The objectives of International Satellite UK-2/S-52 are to continue U.S. Cooperation with the International Scientific Community in the peaceful investigation of atmospheric, ionospheric, and space phenomena. The UK-2/S-52 spacecraft will carry experiments designed and fabricated by the United Kingdom. Three experiments will be performed.

a. Measurement of galactic radio noise in the frequency range 0.75 mc to 3.0 mc.
b. Measurement of the vertical distribution of ozone in the earth's atmosphere.
c. Measurement of micrometeoroid flux.

3.0 TEST DESCRIPTION

3.1 FLIGHT PLAN

The flight plan and nominal trajectory information for the S-127 mission, with a time history from launch to injection into orbit, are presented in Reference (3). Briefly, the payload will be boosted to orbit at fourth stage burn out at approximately T + 479 seconds. This is at a range of 967.66 nautical miles, geodetic altitude of 150.0 nautical miles and at a velocity of 25495.4 feet per second. The vehicle will be launched at an elevation of 90° and pitched to an azimuth of 129.99°. The following table presents the vehicle trajectory at event times.

3.1 FLIGHT PLAN (CONTINUED)

EVENT	TIME (SEC)	RANGE (N. MILES)	GEODETIC ALTITUDE (N. MILES)	RELATIVE VELOCITY (FPS)
STG. 1 B.O.	75.31	17.00	18.52	3714.5
STG. 2 IGN.	94.30	26.06	24.73	3366.3
STG. 2 B.O.	134.20	66.42	42.43	9420.2
STG. 3 IGN.	166.67	112.83	57.60	9109.2
STG. 3 B.O.	200.07	181.43	73.36	17893.2
STG. 4 IGN.	437.94	833.37	150.11	17095.8
STG. 4 B.O.	479.34	967.66	150.00	25495.4

3.2 TIME HISTORY

TIME (SEC)	EVENT	PITCH RATE COMMAND (Deg/Sec)	HOW ACCOMPLISHED
00.00	STG. 1 IGN.	0.0000	Ground Fired
00.20	Start Timer		Flyaway
03.00		-3.04375	Timer Function
08.00		-0.78687	Timer Function
35.00		-0.47500	Timer Function
49.00		-0.38033	Timer Function
75.31	STG. 1 B.O.		
94.30	STG. II IGN.		Timer Function
	Activate "B" Controls		Timer Function
	Separate STG. 1		STG. II IGN
	Remove STG. I Controls		STG. I Sep.
	Switch in Body Bending Filter		Timer Function
110.00		-0.25000	Timer Function
121.00		-0.17719	Timer Function
134.20	STG. II B.O		
138.00	Switch out Body Bending Filter		Timer Function
164.97	Separate P/L H.S.		Timer Function
	Activate "C" Burn Controls		Timer Function
	STG. III IGN. COMMAND		Timer Function

3.2 TIME HISTORY (CONTINUED)

TIME (SEC)	EVENT	PITCH RATE COMMAND (Deg/Sec)	HOW ACCOMPLISHED
166.67	STG. III IGN.		Squib Delay
	Separate STG. II		STG. III IGN.
	Remove STG. II Controls		STG. II Sep.
178.00		-0.12175	Timer Function
200.07	STG. III B.O.		
205.07	Activate "C" Coast Controls		Timer Function
	Switch out Body Bending Filter		Timer Function
210.00		-1.00000	Timer Function
232.73		0.00000	Timer Function
431.94	Spin Motor IGN.		Timer Function
	STG. IV IGN Command		Timer Function
434.44	Explosive Bolt IGN.		Timer Function
	Separate STG. III		Exp. Bolt IGN.
436.18	Retro-force Command		Timer Function
437.94	STG. IV IGN.		Squib Delay
479.34	STG. IV B.O.		

4.0 VEHICLE DATA

4.1 VEHICLE DESCRIPTION

A detailed description of the basic vehicle configuration is presented in Reference (2) and (3). The ignition and destruct detailed circuity is presented in Reference (4). Information concerning field changes, actual vehicle mass characteristics and control system settings are presented in Reference (5). The Auto-Destruct system described in Reference (2) was removed per Reference (4). The International Satellite UK-2/S-52 is described in Reference (6).

4.2 PYROTECHNICS

4.2.1 PYROTECHNIC DEVICES ABOARD VEHICLE

4.2.1.1 MOTORS AND IGNITERS

STAGE	MOTOR TYPE	MOTOR S/N	IGNITER TYPE	MOTOR LOADED WEIGHT LB.	SQUIB DELAY (SEC)	ACTUATOR
FIRST	Algol IIA	16	3184 (Holex)	23,649	0	Ground Fired
SECOND	XM33-E5 (Castor)	183	M 125 Mod 1 (McCormick Selph)	8,863	0	Timer
THIRD	X259-A3 (Antares) II	HPC-126A	SD55A1 (Hercules)	2,797	1.25 (Nom.)	Timer
FOURTH	X248A5S (Altair) I	BSB 407A	SD38B0 (Hercules)	512.7	6.0 (Nom.)	Timer

4.2.1.2 OTHER PYROTECHNIC DEVICES

a) First Stage: One (1) electromechanical SAFE/ARM Explosive Initiator, Beckman and Whitley Model 2253D-02. The unit has dual electrical primers, detonators and booster pellets. Two (2) parallel linear shaped charges on the right-hand side of the engine case, CV23-002040.

b) Second Stage: One (1) electromechanical SAFE/ARM Explosive Initiator, Beckman and Whitley Model 2253D-02. Two (2) linear shaped charges on the right hand side of the engine case, CV23-002040.

c) Third Stage: One (1) electromechanical SAFE/ARM Explosive Initiator, Beckman and Whitley Model 2253D-02. Two (2) linear shaped charges, one on each side of the engine case, CV23-002040. Four (4) igniters for the two (2) ignition destruct batteries-Eagle Pitcher GAP 4023-9 located in Upper "C" transition section.

d) Fourth Stage: Two (2) ballistic cartridges for 34 inch heat shield, HOLEX EX 38 Mod. 3. Four (4) spin motors, Atlantic Research Corporation. Two (2) TSK 4-23074-2 (1KS40HA) and two (2) 06-24-38-1 (0.6KS40HA)
Four (4) spin motor igniters U.S. Flare 908A
Four (4) explosive bolts for the separation system Marman clamp, CV23-002435.

4.2.2 PAYLOAD PYROTECHNIC DEVICES

Four (4) Hercules DM29A0 Dimple motors for despin.
Two (2) Holex 2801 Guillotine cable cutters for boom erection.
Two (2) Holex 2801 Guillotine cable cutters for paddle erection.
Two Hi-shear PC24 power cartridges for separation system.

5.0 MASTER COUNTDOWN

The detailed Master Countdown for the S-127 mission is presented in Reference (7), which includes procedures for checkout, abort, vehicle recovery, etc.

5.1 SCHEDULES

The dress rehearsal and operational countdown, which are T-2 and T-0 days respectively are organized in functional blocks with time allotted for each block. In the event a function is completed ahead of its scheduled completion time, the next item of the procedure will proceed without holding for its scheduled starting time. If required, a HOLD will be made to keep the T-1.0 hour to the schedule herein.

5.1.1 DRESS REHEARSAL

COUNTDOWN TIME	E T	ZULU TIME	DELTA TIME	FUNCTION
T-7.0 Hr.	0800	1300	2.0 hr.	P/L Checks
T-5.0 Hr.	1000	1500	3.0 hr.	Electronic Check Out
T-2.0 Hr.	1300	1800	.5 hr.	Final Launcher/Vehicle Prep.
T-1.5 Hr.	1330	1830	.5 hr.	Arming
T-1.0 Hr.	1400	1900	.5 hr.	Remove Vehicle Environment Cont.
T-30 Min.	1430	1930	.5 hr.	Terminal Countdown
T-2 Min.	1458	1958	-	Start Sequencer
T-30 Sec.	-		-	Start Launcher Programmer
T-0	1500	2000	-	LIFT OFF
	1500	2000	1.0 hr.	Functional Practice

5.1.2 OPERATIONAL COUNTDOWN

COUNTDOWN TIME	EST	ZULU TIME	DELTA TIME	FUNCTION
T-8.0 Hr.	1400	1900	2.0 hr	Payload Checks
T-6.0 Hr.	1600	2100	2.5 hr	Electronic Check Out
T-3.5 Hr.	1830	2330	1.0 hr	Fueling
T-2.5 Hr.	1930	0030	1.0 hr	Final Launcher/Vehicle Prep.
T-1.5 Hr.	2030	0130	.5 hr	Arming
T-1.0 Hr.	2100	0200	.5 hr	Remove Vehicle Environment Cont. and Final Camera Adjustment.
T-30 Min.	2130	0230	.5 hr	Terminal Countdown
T-2 Min.	2158	0258	-	Start Sequencer
T-30 Sec.	2200	-	-	Start Launcher Programmer
T-0	2300	0300	-	LIFT OFF

5.1.3 OPERATIONAL COUNT UP

The Test Director will control the count-up in accordance with normal Wallops procedure.

COUNT-UP TIME	MIN.	SEC.	FUNCTION
T	0	0	Announce LIFT-OFF
T+	0	15	Start counting at 5 second intervals
T+	1	15	STG. I B.O.
T+	1	30	Start counting at 1 second intervals
T+	1	34	STG. II IGN.
T+	1	40	Start counting at 5 second intervals
T+	2	15	Start counting at 1 second intervals
T+	2	14	STG. II B.O.
T+	2	45	Separate P/L H.S.
T+	2	47	STG. III IGN.
T+	2	50	Start counting at 5 second intervals
T+	3	20	STG. III B.O
T+	3	30	Start Counting at 30 second intervals
T+	7	0	Start Counting at 5 second intervals
T+	7	10	Start Counting at 1 second intervals
T+	7	12	Spin motor IGN.
T+	7	14	Separate 4th step.
T+	7	15	Retro-force Command
T+	7	18	STG. IV IGN.
T+	7	20	Start counting at 10 second intervals
T+	7	59	STG. IV B.O. STOP COUNT

5.1.4 ABORT PROCEDURE

The abort procedure will be in concurrence with Reference (7) for both the Dress Rehearsal and Operational Countdown.

5.1.5 OPERATIONAL SCHEDULE AND PROCEDURES

A chart summarizing the final three day operational schedule, with specific group participation included, is presented on the following page. Activity within each time block will be controlled by the CVC engineering supervisor in charge of the current phase. The CVC Test Conductor will be kept regularly advised of progress at the pad, and in particular of anticipated delays. The CVC Test Conductor will advise the Assistant Test Director of any deviations from the planned schedule so that he may affectively coordinate range support. The vehicle preparation for launching will be controlled by the CVC Test Conductor with monitoring by Langley Research Center personnel. The countdown will be controlled by the Test Director or his assistant with concurrence of the CVC Test Conductor. Requests for "hold" will be made through the CVC Test Conductor, the Test Director, or the Assistant Test Director. The Test Director or his assistant will announce the "hold" giving the reason, the estimated duration, and the estimated time of resumption of the count.

OPERATION PLAN FOR SCOUT S-127

DAY	TIME EST	FUNCTION	GUID	INST	PYRO	INSP	FUEL	VEH TWR	P/L	WALLOPS RANGE
T-2	0800	Payload Checks						X	X	None
	1000	Electronic Check Out	X	X	X	X	X	X	X	PYRO, T/M, RADARS, FRW-2
	1300	Final Launcher/Vehicle Prep.				X		X		PYRO
	1330	Arming			X	X	X			PYRO
	1400	Remove Vehicle Environment Controls			X	X		X		PYRO
	1430	Terminal Countdown	X	X	X	X	X	X	X	Practice Support
	1500	Functional Practice	X	X	X	X	X	X	X	Practice Support
	1530	Secure Vehicle						X		None
T-1	0800	Start Recovery - Remove H/Shield				X		X	X	None
	1630	Recovery Complete - Re-Install H/Shield								
T-0	1400	Payload Checks						X	X	None
	1600	Electronic Check Out	X	X	X	X	X	X	X	PYRO, T/M, RADARS, FRW-2
	1830	Fueling				X	X	X		Damage Control
	1930	Final Launcher/Vehicle Prep.				X		X		PYRO
	2030	Arming			X	X	X			PYRO
	2100	Remove Veh. Env. Cont's - Final Camera Adj.			X	X	X	X		PYRO - Photo
	2130	Terminal Countdown	X	X	X	X	X	X	X	Operational Support
	2200	LIFT OFF								

5.2 MISSION PERSONNEL

5.2.1 PERSONNEL ASSIGNMENTS

FUNCTION	NAME	AFFILIATION & LOCATION
a) Test Director	R. T. Duffy	WI RCC
b) WI Test Conductor	T. W. Perry, Jr.	WI RCC
c) Range Safety Officer	L. C. Parker	WI RCC
d) SPG. Project Manager	E. M. Schult	LRC RCC
e) CVC Field Supervisor	B. H. Kilgore	CVC Blockhouse
f) CVC Test Conductor	H. F. White	CVC Blockhouse
g) LRC Test Conductor	J. D. Church	LRC Blockhouse
h) WI Pad Supervisor	B. J. Flowers	WI Blockhouse
i) P/L Project Manager	E. W. Hymowitz	GSFC RCC
j) P/L Coordinator	J. E. Flynn	GSFC RCC
k) Project Scientist	L. Dunkelman	GSFC VIP Room
l) Project System Engineer	A. C. Davidson	GSFC Blockhouse
m) Project Scientist	Dr. R. Jennison	UK VIP Room
n) Project Scientist	Dr. K. Stewart	UK VIP Room
o) SRMU Project Mgr.	E. B. Dorling	UK VIP Room
p) GSFC Observer	R. C. Bauman	GSFC VIP Room
q) UK Observer	Sir Harrie Massey	UK VIP Room
r) Blockhouse Console Operators:		
1) Guidance	J. M. Dudley	CVC
2) Controls	C. C. Hammer	CVC
3) Tower	V. Galvan	CVC
4) Vehicle Switching	V. Galvan	CVC
5) P/L Switching	A. Davidson	GSFC
6) P/L Controls	M. Mandell	GSFC
7) Arming	B. W. Roberts	CVC
s) Blockhouse Monitor Consoles:		
1) Communications	J. D. Church	LRC
2) Guidance	L. W. Jarvis	CVC
3) Controls	R. D. Fielder	CVC
4) Test Conductor	H. F. White	CVC
5) Instrumentation	J. M. Lanier	CVC
6) P/L No. 1	H. Leverone	GSFC
7) P/L No. 2	R. Beard	GSFC
8) Arming	R. V. Blood	CVC
9) Pad Supervisor	B. J. Flowers	WI

6.0 SUPPORT REQUIREMENT DETAILS

6.1 FLIGHT SAFETY REQUIREMENTS

The Flight Safety requirements and Ground Safety Plan for Scout S-127 have been promulgated by the Wallops Range Safety Section and are defined in Reference (8).

6.2 VEHICLE RANGE SUPPORT REQUIREMENTS

In order to conduct the Scout countdown, launch and flight, and to define the performance of the Scout vehicle during these periods, Wallops Station Ground Support is required in various areas. The following subsections define these requirements.

6.2.1 DATA ACQUISITION

6.2.1.1 TELEMETRY

6.2.1.1.1 VEHICLE PERFORMANCE TELEMETRY

Telemetry	Vehicle Performance
Modulation	PAM/FM/FM 18 Channels
Frequency	244.3 mc
Power Output	10 watts
Channel Assignment	(See Table I)

a) A magnetic tape of the composite signal is required during certain portions of the countdown and from T-0 to maximum range. In addition to the normal Wallops 1" tape, a ½" tape for Vought/Dallas is required to contain the following tracks:

D Telemetry
Voice Count
100 KC "wow" compensation
Timing Code

b) Four (4) real time records are required from the vehicle telemetry system from T-0 to loss of signal. All four (4) records will be delivered to FEC as soon as possible after loss of signal. Record No. 1 and 2 will be monitored in the Telemetry Building by Range Safety during flight. The setup for these records is as follows:

6.2.1.1.1 VEHICLE PERFORMANCE TELEMETRY (CONTINUED)

RECORD NO. 1 (Data Flash)

GALV. POS.	FILTER	QUANTITY	SCO	COMM. CH.	DEFLECTION
Ref. Line					
Timing					
Track A	450 cps	Roll Displ.	40.00 kc	4,8,12,16,20	0.5" to 4.0"
Track B	450 cps	Pitch Displ.	40.00 kc	5,9,13,17,21	4.0" to 7.5"
Track C	450 cps	Yaw Displ.	40.00 kc	3,7,15,19,24	7.5" to 11.0"
Timing					
Ref. Line					

*RECORD NO. 2 (Data Flash)

GALV. POS.	FILTER	QUANTITY	SCO	COMM. CH.	DEFLECTION
Ref. Line					
Timing					
Track A	110 cps	A_1	14.5 kc		0 to 3"(+only)
**Track B	450 cps	Events	40.0 kc	1,11,23	0 to 3"(+only)
Track C	25 cps	P. P. Volts	1.7 kc		0 to 3"(+only)
Timing					

*All tracks of Records No. 1 and No. 2 to have zero references.
**NOTE: %Bandwidth Heatshield 14%, C/D Rec #2-55%, C/D Rec #1-27.7%
All events 96.7%.

RECORD NO. 3 (Data Flash)

GALV. POS.	FILTER	QUANTITY	SCO	COMM. CH.	DEFLECTION
Ref. Line					
Timing					
Track A	35 cps	Roll Rate	3.9 kc		0.1" to 1.9"
Track B	80 cps	Pitch Rate	5.4 kc		2.0" to 3.9"
Track C	8 cps	Yaw Rate	0.56 kc		4.0" to 5.9"
*Track D	450 cps	2nd HCP	40 kc	2,10,18	6" to 10"(+only)
	450 cps	3rd HCP	40 kc	6,14,22	6" to 10"(+only)
Timing					
Ref. Line					

*NOTE: 2nd & 3rd HCP coincidental at T-0

6.2.1.1.1 VEHICLE PERFORMANCE TELEMETRY (CONTINUED)

RECORD NO. 4 (Data Rite)

GALV. POS.	FILTER	QUANTITY	SCO	DEFLECTION
Ref. Line	______	______	______	______
Timing	______	______	______	______
Track A	25 cps	2nd & 3rd lower Roll Mtrs.	3.0 kc	.5" to 1.5"
Track B	14 cps	2nd & 3rd Yaw Motors	0.96 kc	1.6" to 2.6"
Track C	11 cps	2nd & 3rd Large & Small Motors	0.73 kc	2.7" to 3.7"
Track D	20 cps	2nd & 3rd Upper Roll Mtrs.	1.3 kc	3.8" to 4.8"
Track E	110 cps	Normal Acceleration	10.5 kc	5.0" to 8.0"
Track F	110 cps	Long Acceleration	14.5 kc	8.0" to 10.0"
Track G	80 cps	Transverse Acceleration	7.35 kc	10.1" to 11.9"
Timing	______	______	______	______
Ref. Line	______	______	______	______

*NOTE: All records at 2.56" per second. Record No. 4 track may overlap if necessary.

6.2.1.1.2 PAYLOAD TELEMETRY

Telemetry Type	Payload Data
Modulation	PFM
Frequency	136.560 mc
Power Output	250 milliwatts
Channel Assignment	See Ref. (6)
Data Required and Period	See Ref. (6)

6.2.1.2 RADARS

a) Type — FPS-16

Mode of Operation — Beacon-track. Switch to skintrack if beacon fails.

Frequency — Receive 5486.5 mc; Transmit 5800.0 mc.

Beacon Type — CVRT 61B C-Band.

Beacon Pwr Output — 500 watts

Data Period — From target acquisition after launch to maximum tracking range.

Data Requirements —
1) Plotboard. Display analog output in the ground and vertical planes in Central Control for monitoring by Range Safety Officer.
2) Scope Film (35mm).
3) Nixie Film (35mm).
4) Magnetic Tape.

6.2.1.2 RADARS (CONTINUED)

b)	Type	SCR-584
	Mode of Operation	Skin-track
	Data Period	From target acquisition after launch to maximum tracking range.
	Data Requirements	1) Plotboard. Display analog output in the ground and vertical planes in Central Control for monitoring by Range Safety Officer. 2) Range, azimuth, elevation film.
c)	Type	Mod II.
	Mode Of Operation	Skin-Track.
	Data Period	From target acquisition after launch to maximum tracking range.
	Data Requirements	1) Plotboard. Display analog output in the ground and vertical planes in the Central Control for monitoring by Range Safety Officer. 2) Range, azimuth, elevation film. 3) Magnetic tape.
d)	Type	SPANDAR.
	Mode of Operation	Skin-track.
	Data Period	From target acquisition after launch to maximum tracking range.
	Data Requirements	1) Plotboard. Display analog output in the ground and vertical planes in Central control for monitoring by Range Safety Officer. 2) Magnetic tape.
e)	Type	MIT, Mainland
	Mode of Operation	Skin-track.
	Data Period	From target acquisition after launch to maximum tracking range.
	Data Requirements	1) Magnetic tape 2) Film (35mm). 3) V-T Curve.
f)	Type	FPS-16 Bermuda.
	Mode of Operation	Beacon Track. Switch to skin-track if beacon fails.
	Frequency	Receives 5486.5 mc, transmit 5800.0 mc.
g)	Beacon Type	CVRT 61B C-Band.
	Beacon Pwr. Output	500 watts.
	Data Period	From target acquisition to 4th stage ignition.
	Data Requirements	Display analog output in ground and vertical planes in Mercury Central Control at Bermuda.

6.2.1.3 PHOTOGRAPHIC COVERAGE

Photographic coverage for S-127 will include both fixed and tracking cameras at the various camera stations. A summary of the proposed photographic coverage for this mission is presented in Reference (9).

6.2.1.4 METEOROLOGICAL DATA

Meteorological information is required to define the wind disturbances aloft before and after launch to provide supporting data for trajectory analysis. The meteorological requirement will be as follows:

a) Type — Rawinsonde.
   Data Period — T-1½ hr and T+30 min.
   Data Requirements — To maximum altitude.
   1) Temperature, Pressure and Humidity.
   2) Wind direction and velocity.

b) Type — Pibal.
   Data Period — 1) Every 10 minutes from T-30 minutes to T+30 minutes (up to 5,000 feet).
   Data Requirement — Wind Profile

c) Type — Aerovane.
   Data Period — Aerovane readings every 5 minutes and at significant changes from T-45 minutes to T-5 minutes and thereafter every one minute until T+5 minutes. These readings to be taken at the 50, 100, 150, 200 and 250 foot levels.

6.2.2 ADDITIONAL REQUIREMENTS

6.2.2.1 COMMUNICATIONS

Three modes of communications will be employed; intercom, radio, and telephone. The type of communication required for each position at the various locations are listed as follows:

6.2.2.1 COMMUNICATIONS (CONTINUED)

POSITION	LOCATION	RADIO-UHF 326.3 MC-P 382.6 MC-2	INTER-COM	TELEPHONE
Test Director	RCC	X	X	X & SCAMA
Range Safety Officer	RCC	X	X	X & SCAMA
Ass't Test Director	RCC		X	X
LRC Test Conductor	BH		X	X
CVC Test Conductor	BH		X	X
Op. Console Pers.	BH		X	X
Mon. Console Pers.	BH		X	
Pad Positions	TWR., etc.		X	X
Range Positions (local)	RADAR, etc.		X	X

"Hot Lines" with tracking stations other than Wallops Range will be established by telephone by Range personnel at the scheduled times. P/L communications network requirements are as defined in Reference (6).

6.2.2.2 COMMAND-DESTRUCT TRANSMITTERS

A dual FRW-2 transmitter is required to maintain ground control of the vehicle after liftoff, in order that the flight termination command may be sent by the Range Safety Officer at any time during the flight prior to fourth stage ignition.

a) Type — FRW-2 (Dual Set-Up).
Mode of Operation — Continuous Modulation
Period Required — During countdown checks, the final countdown, and throughout the flight.
Destruct Capability Location — RCC Range Safety Officer.

NOTE: Bermuda FRW-2 is part of this system.

6.2.2.3 POST-OPERATION SUPPORT

Post-operation data requirement support is discussed separately in section 7.0 of this plan.

6.2.2.4 STATION CONTROL

Damage control and first aid availability will be maximum during the countdown and launching period.

7.0 POST-OPERATION DATA REQUIREMENTS

During the Scout S-127 countdown and flight, Wallops Instrumentation stations will acquire the telemetry, radar, photographic, and meteorological data as specified in Section 6.0 of this plan. Detailed vehicle telemeter oscillograph playback requirements including channel groupings, channel assignments, filters, deflection, and paper speed, are presented in Table II. Immediately after completion of the operation, when station committments on S-127 flight are completed, vehicle performance data required by the Contractor and Langley Research Center will be gathered and distributed as early as possible by the Wallops Scout Project Engineer to the various agencies. A listing of the performance data requirements is presented on the following page.

OPERATION PLAN FOR SCOUT S-127

POST-OPERATION DATA REQUIREMENTS (CONTINUED)

7.0

	DATA FOR CVC/WALLOPS	DATA FOR LRC
DATE S... Radars	1. Orig. Plotboard	1. 1 Copy Plotboard
	1. Orig. Plotboard	1. 1 Copy Plotboard
	1. Orig. Plotboard	1. 1 Copy Plotboard
	1. Orig. Plotboard	1. 1 Copy Plotboard
	1. Orig. Plotboard	1. 1 Copy Plotboard
	1. ---------	1. Orig. Magnetic Tape
Telemeter	1. Copies of each record per Table II	1. Copies of each record per Table II
	2. Wallops Orig. 1/2" Mag. tape.	2. Wallops Orig. 1" Mag. tape
	3. 1/2" Copy Bermuda Magnetic tape.	3. 1" Orig. Bermuda Magnetic tape.
Photog...	In accordance with Ref (9)	
	1. 1 copy 16 mm color from a tracking camera.	1. Orig. 16 & 35 mm color
	2. 1 copy 35 mm B & W from a fixed camera.	2. Orig. 16 & 35 mm B & W
Meteoro...	1. 1 copy reduced Pre-Launch Rawinsonde & Wind profile.*	1. 1 copy reduced Pre-Launch Rawinsonde and Wind profile.
	2. 1 copy reduced Post-Launch Rawinsonde & Wind profile.*	2. 1 copy reduced Post-Launch Rawinsonde and Wind profile.
	3. 1 copy Aerovane data at time of launch.	3. ---------
	4. The following at time of launch: a) Cloud Cover b) Surface Temperature (°F) c) Relative Humidity (%) d) Atmospheric Pressure (In. Hg.) e) Visibility (S. miles) f) Ceiling (Feet) g) Surface Winds (Kts and Degrees)	

*Reduc... ...aluation of data will be performed by Wallops Station. Data will be ... in 5,000 feet increments with temperature and humidity data below ... intermediate altitudes as changes occur.

NOTE: Processed radar films will be retained by Wallops. Two (2) copies of IBM coded listings will be provided for CVC/Wallops, and one (1) copy will be provided for NASA/SPG from combined radar data from first acquisition to maximum range.

TABLE I
SCOUT S-127
8.0 TELEMETRY CHANNEL ASSIGNMENT - VEHICLE

A. Continuous Measurements:

CHANNEL	FUNCTION	RANGE
0.56 KC	YAW Rate	$\pm 5^{\circ}$/Sec.
0.73 KC	2nd Pitch Mtrs. & 3rd Large Pitch Mtrs.	ON-OFF
0.96 KC	2nd & 3rd Stage Yaw Motors	ON-OFF
1.30 KC	2nd & 3rd Stage Upper Roll Motors	ON-OFF
1.70 KC	Pitch Program Voltage	0 to 1247 Mv.
2.30 KC	3rd Stage Small Pitch Motors	ON-OFF
3.00 KC	2nd & 3rd Stage Lower Roll Motors	ON-OFF
3.90 KC	Roll Rate	$\pm 10^{\circ}$/Sec.
5.40 KC	Pitch Rate	$\pm 5^{\circ}$/ Sec.
7.35 KC	Transverse Accelerometer	$\pm$ 10 g's
10.50 KC	Normal Accelerometer	$\pm$ 10 g's
14.50 KC	Longitudinal Accelerometer	-4 to +20 g's
22.00 KC	Guidance Package Ref. Voltage	15 Vrms. 4[illegible] cps
30.00 KC	Commutator Deck B	________
40.00 KC	Commutator Deck A	________

TABLE I (CONTINUED)
SCOUT S-127
TELEMETRY CHANNEL ASSIGNMENT - VEHICLE

B. Commutator Measurements - Deck "B"

CHANNEL	FUNCTION	RANGE
1	#1 Fin Position	$\pm 20^\circ$
2	#2 Fin Position	$\pm 20^\circ$
3	#3 Fin Position	$\pm 20^\circ$
4	#4 Fin Position	$\pm 20^\circ$
5	Guidance Package Temperature	350° F
6	H_2O_2 Pressure Trans. "B"	600 psia
7	3rd Stage N_2 Line Temperature	350° F
8	Rate Gyro Heatshield	350° F
9	#1 Fin Position	$\pm 20^\circ$
10	#2 Fin Position	$\pm 20^\circ$
11	#3 Fin Position	$\pm 20^\circ$
12	#4 Fin Position	$\pm 20^\circ$
13	Trans. D Ambient Temperature	350° F
14	Trans. "B" Nozzle Insul. Temp.	350° F
15	Trans. "C" Nozzle Insul. Temp.	350° F
16	Yaw Left Mtr. Temp. Upper "C"	350° F
17	#1 Fin Position	$\pm 20^\circ$
18	#2 Fin Position	$\pm 20^\circ$
19	#3 Fin Position	$\pm 20^\circ$
20	#4 Fin Position	$\pm 20^\circ$
21	2nd Stage N_2 Line Pressure	3500 psia
22	3rd Stage N_2 Line Pressure	3500 psia
23	Hydraulic Accum. Pressure	3500 psia
24	1st Stage Head Cap Pressure	800 psia
25	H_2O_2 Pressure Trans. "C"	600 psia
26	50% (2.5 vdc)	----
27	0% (0.0 vdc)	----
28	100% (5.0 vdc)	----
29	100% (5.0 vdc) Sync	----
30	100% (5.0 vdc)	----

TABLE I (CONTINUED)
SCOUT S-127
TELEMETRY CHANNEL ASSIGNMENT - VEHICLE

C. Commutator Measurements - Deck "A"

CHANNEL	FUNCTION	RANGE
*1	Events	ON-OFF
2	2nd Stage Head Cap Pressure	800 psia
3	Yaw Displacement	$\pm 5^\circ$
4	Roll Displacement	$\pm 5^\circ$
5	Pitch Displacement	$\pm 5^\circ$
6	3rd Stage Head Cap Pressure	400 psia
7	Yaw Displacement	$\pm 5^\circ$
8	Roll Displacement	$\pm 5^\circ$
9	Pitch Displacement	$\pm 5^\circ$
10	2nd Stage Head Cap Pressure	800 psia
*11	Events	ON-OFF
12	Roll Displacement	$\pm 5^\circ$
13	Pitch Displacement	$\pm 5^\circ$
14	3rd Stage Head Cap Pressure	400 psia
15	Yaw Displacement	$\pm 5^\circ$
16	Roll Displacement	$\pm 5^\circ$
17	Pitch Displacement	$\pm 5^\circ$
18	2nd Stage Head Cap Pressure	800 psia
19	Yaw Displacement	$\pm 5^\circ$
20	Roll Displacement	$\pm 5^\circ$
21	Pitch Displacement	$\pm 5^\circ$
22	3rd Stage Head Cap Pressure	400 psia
*23	Events	ON-OFF
24	Yaw Displacement	$\pm 5^\circ$
25	Spare (0 Volts)	----
26	50% (2.5 vdc)	----
27	0% (0 vdc)	----
28	100% (5.0 vdc)	----
29	100% (5.0 vdc) Sync	----
30	100% (5.0 vdc)	----

*Events % Bandwidth HS eject 14% CD Rec #1 27.7%, CD Rec #2 55%, All events 96.7%.

TABLE II
SCOUT S-127 PERFORMANCE TELEMETRY - VEHICLE
OSCILLOGRAPH PLAYBACK SET-UP

1. Permanent paper records (oscillograph) are required by CVC, and LRC. The following chart defines the records required by these agencies:

RECORD NUMBER	CVC 0.4"/Sec.	LRC 0.4"/Sec.	LRC 4.0"/Sec.
1	2 copies	1 copy	1 copy
2	2 copies	1 copy	1 copy
3	2 copies	1 copy	1 copy
4	2 copies	1 copy	1 copy
5	2 copies	1 copy	1 copy
6	2 copies	1 copy	1 copy
7	2 copies	1 copy	1 copy
8	2 copies	1 copy	1 copy

2. Reference lines will be located at top, center and bottom of each record. Binary timing will be located at the top and bottom of each record.

RECORD #1

TRACK	FILTERS	QUANTITY	SCO	COMM. CHANNEL	FULL SCALE PEN DEFL.
A	450 cps	Roll Displ.	40.00 KC	4,8,12,16,20	0.2" to 3.0"
B	14 cps	Roll Rate	3.90 KC	-----	3.1" to 6.0"
C	25 cps	2nd & 3rd Lwr	3.00 KC	-----	6.1" to 6.7"
D	20 cps	2nd & 3rd Upr Roll	1.30 KC	-----	6.8" to 7.5"
*E	450 cps	2nd H.C.P.	40.00 KC	2,10,18	7.6" to 9.6"
	450 cps	3rd H.C.P.	40.00 KC	6,14,22	7.6" to 9.6"
F	450 cps	Events	40.00 KC	1,11,23	9.7" to 11.0"

RECORD #2

TRACK	FILTERS	QUANTITY	SCO	COMM. CHANNEL	FULL SCALE PEN DEFL.
A	450 cps	Pitch Displ.	40.00 KC	5,9,13,17,21	0.2" to 3.0"
B	25 cps	Pitch Rate	5.40 KC	-----	3.1" to 6.0"
C	25 cps	Pitch Program V	1.70 KC	-----	6.1" to 7.5"
D	11 cps	2nd & 3rd Large Pitch	0.73 KC	-----	7.6" to 8.3"
E	30 cps	3rd Small Pitch	2.30 KC	-----	8.4" to 9.1"
*F	450 cps	2nd H.C.P.	40.00 KC	2,10,18	9.2" to 11.7"
	450 cps	3rd H.C.P.	40.00 KC	6,14,22	9.2" to 11.7"

*Note: 2nd and 3rd Stage Head Cap Pressures should be coincidental at T-0.

TABLE II (CONTINUED)
SCOUT S-127 PERFORMANCE TELEMETRY - VEHICLE
OSCILLOGRAPH PLAYBACK SET-UP

TRACK	FILTERS	QUANTITY	SCO	COMM. CHANNEL	FULL SCALE PEN DEFL.
RECORD #3					
A	450 cps	Yaw Displ.	40.00 KC	3,7,15,19,24	0.2" to 3.0"
B	14 cps	Yaw Rate	0.56 KC	-----	3.1" to 6.0"
C	14 cps	2nd & 3rd Yaw Mtr	0.96 KC	-----	6.0" to 6.8"
D	25 cps	2nd & 3rd Lwr Roll	3.00 KC	-----	6.9" to 7.6"
E	20 cps	2nd & 3rd Upper Roll	1.30 KC	-----	7.7" to 8.4"
F	450 cps	2nd Stage H.C.P.	40.00 KC	2,10,18	8.5" to 10.0"
	450 cps	3rd Stage H.C.P.	40.00 KC	6,14,22	10.1" to 11.6"
RECORD #4					
A	110 cps	Trans. Acc.	7.35 KC	-----	0.2" to 3.0"
B	110 cps	Normal Acc.	10.50 KC	-----	3.1" to 6.0"
C	110 cps	Long. Acc.	14.50 KC	-----	6.1" to 9.0"
D	330 cps	Twr. Fin Pos.(#1)	30.00 KC	1,9,17	9.1" to 10.1"
E	330 cps	Bottom Fin Pos. (#3)	30.00 KC	3,11,19	10.2" to 11.1"
F	14 cps	Yaw Rate	0.56 KC	-----	11.1" to 11.9"
RECORD #5					
A	330 cps	Left Fin Pos. (#2)	30.00 KC	2,10,18	0.2" to 1.2"
B	330 cps	Right Fin Pos. (#4)	30.00 KC	4,12,20	1.3" to 2.3"
C	330 cps	1st Stage H.C.P.	30.00 KC	24	2.4" to 3.9"
D	11 cps	Pitch Rate	5.40 KC	-----	4.0" to 7.0"
E	14 cps	Pitch Prog. Volts	1.70 KC	-----	7.1" to 8.6"
F	110 cps	Long. Acc.	14.50 KC	-----	8.7" to 11.7"
RECORD #6					
A	330 cps	2nd Stage N_2 Press.	30.00 KC	21	0.2" to 1.7"
B	330 cps	3rd Stage N_2 Press.	30.00 KC	22	1.8" to 3.3"
C	330 cps	Hyd. Accum. Press.	30.00 KC	23	3.4" to 4.9"
D	330 cps	1st Stage H.C.P.	30.00 KC	24	5.0" to 6.5"
E	330 cps	3rd Stage N_2 Temp.	30.00 KC	7	6.6" to 8.3"
F	330 cps	H_2O_2 Press "B"	30.00 KC	6	8.4" to 9.4"
G	330 cps	H_2O_2 Press "C"	30.00 KC	25	9.5" to 10.5"

TABLE II (CONTINUED)
SCOUT S-127 PERFORMANCE TELEMETRY - VEHICLE
OSCILLOGRAPH PLAYBACK SET-UP

TRACK	FILTERS	QUANTITY	SCO	COMM. CHANNEL	FULL SCALE PEN DEFL.
RECORD #7					
A	330 cps	Guid. Temp.	30.00 KC	5	0.2" to 1.7"
B	330 cps	Rate Gyro Heat-shield	30.00 KC	8	1.8" to 3.3"
C	330 cps	Trans "D" Amb. Temp.	30.00 KC	13	3.4" to 4.9"
D	330 cps	Trans "C" Noz. Ins Temp.	30.00 KC	15	5.0" to 6.5"
E	330 cps	Trans "B" Noz. Ins. Temp.	30.00 KC	14	6.6" to 8.1"
F	330 cps	Trans "C" YL Mtr Temp.	30.00 KC	16	8.2" to 9.7"
RECORD #8					
A	110 cps	Long Acc.	14.50 KC	-----	0.5" to 6.0"
*B	330 cps	1st Stage H.C.P.	30.00 KC	24	6.5" to 11.0"
*C	450 cps	2nd Stage H.C.P.	40.00 KC	2,10,18	6.5" to 11.0"
*D	450 cps	3rd Stage H.C.P.	40.00 KC	6,14,22	6.5" to 11.0"

Note: *Head Cap Pressures should be coincidental at T-0.

REFERENCES

1) Contract NAS 1-2189, "Field Support Services for NASA Wallops Station."

2) CVC Report No. 3-13000/2R-149 "Scout S-110 and subsequent Pre-Flight Planning Report, NASA Scout Contract NAS-1295", dated 29 June 1962.

3) CVC Report No. 3-30000/3R-258 "Scout S-127 Pre-Flight Planning Report, NASA Scout Contract NAS-1295", dated 7 October 1963.

4) AST/Wallops Letter 3-13819/3L9 "Scout S-127 Ignition and Destruct System", Revised 4 September 1963.

5) Vehicle Data Log, S-127 Scout.

6) Payload Description Document including Launch Operation Requirements for International Satellite UK-2/S-52, dated 1 March 1963.

7) Enclosure (1) to CVC Memo AST/Wallops 3-33151/3L15 "Scout Vehicle Master Countdown Manual", dated 10 October 1963.

8) Wallops Station Handbook, Volume IV, "Safety", dated 30 September 1961.

9) Wallops Station Memo - Photographic Coverage for Scout S-127.

NASA Langley, 1964